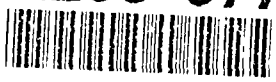

STUDY PROJECT

IRON SAPPERS LEAD THE WAY: THE 16TH ENGINEER BATTALION'S SUPPORT OF 1ST ARMORED DIVISION IN SOUTHWEST ASIA

BY

LIEUTENANT COLONEL RONALD A. ADKINS
United States Army

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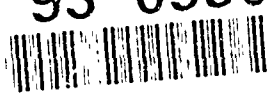

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Operations in the desert of Southwest Asia presented enormous challenges to the organic engineer battalion supporting the 1st Armored Division in its defeat of the Iraqi Republican Guard Forces during Operations Desert Shield and Desert Storm. Most of these challenges were METT-T driven. Although unachievable at times, most combat engineer doctrine proved to be basically sound, with the exceptions in certain matters of engineer combat operations, engineer command and control, countermine capability, and obstacle marking. This Personal Experience Monograph documents the challenges and problems encountered by the battalion through initial notification of deployment, arrival in theater, The 100 Hour War, cease fire operations in Iraq and Kuwait, and redeployment to Germany. Other lessons were learned concerning preparation for overseas movement, the family support group program, tactical assembly area layout, engineer intelligence gathering capability, engineer Class V requirements, engineer equipment winners and losers, and transportation challenges in Germany. The six weeks of post combat operations represented the best hands on training experienced by the battalion since World War II. The catalyst for all the accomplishments in the desert was soldier professionalism. Our engineer soldiers have never been better. Their initiative, pride, and professionalism made the difference. They made our operations successful.

USAWC MILITARY STUDIES PROGRAM PAPER

IRON SAPPERS LEAD THE WAY: THE 16th ENGINEER BATTALION'S SUPPORT OF 1st ARMORED DIVISION IN SOUTHWEST ASIA

AN INDIVIDUAL STUDY PROJECT

by

Lieutenant Colonel Ronald A. Adkins
United States Army

Colonel David E. Shaver
Project Advisor

U.S. Army War College
Carlisle Barracks, Pennsylvania 17013

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INTRODUCTION

When Iraq invaded Kuwait on 2 August 1990, spearheaded by three heavy divisions of the elite Republican Guards, infantry and special forces, world reaction was quick and certain in condemning the act of brutal aggression. Iraq threatened the world's access to oil, and the United States responded immediately to this threat to our vital national interest.[1]

President George Bush soon dedicated forces to Saudi Arabia as a show of force to deter Iraq from continuing to move south into Saudi Arabia. In his address to the nation on 8 August 1990, the President declared: "We agree that this is not an American problem or a European problem or a Middle East problem: it is the world's problem."[2]

On 8 November 1990, President Bush decided to increase the U.S. presence in Southeast Asia and turned to the VII Corps for an armor-heavy combat force to give coalition forces an offensive capability. The 1st Armored Division (AD) then deployed from Germany to Saudi Arabia with VII Corps.

In concert with 1st AD leaders and soldiers, the 16th Engineer (EN) Battalion (BN) reacted swiftly to the new mission in three critical areas: planning, training, and unit deployment. All three of these activities played an integral part in the successful defeat of the Iraqi Republican Guard Forces. Although engineer doctrine proved to be basically sound, the vast area of operations, the desert terrain, absence of land routes, extreme weather, and a several hundred kilometer movement

to contact operation demanded a well-trained and well-rehearsed engineer organization.

Airland Battle (ALB) doctrine was understood, accepted and trained at all levels of command. Commanders and key staff officers planned and thought in terms of the tenets of ALB. Physical agility was achieved through rehearsals and perfection of large, fast-moving formations trained to execute battle drills as needed.[3] Battle-focused training as set forth in Field Manual 25-100, Training the Force, was conducted by all engineers during the campaign. Engineer commanders from Corps through company developed mission essential task lists and trained to them. This training made extensive use of rehearsals and battle drills followed by after action reports.

This Personal Experience Monograph (PEM) will address the challenges faced by the battalion as it prepared for deployment, underwent pre-combat, combat, and post-combat operations in support of 1st AD. Additionally, doctrinal issues related to these operations and lessons learned, including recommendations, will be discussed as they apply to pre-deployment, command and control, mobility, countermobility, countermine operations, and survivability.

BACKGROUND

The 16th Engineer Battalion conducted pre-Combat Maneuver Training Center (CMTC) training with 1st AD in August 1990. During most of August through late September 1990, the 16th

Engineer Battalion participated in Ironstar 90B--the rotation of maneuver brigades through the CMTC in Hohenfels, Germany. Each engineer company provided habitual support to its maneuver brigade as it rotated through the CMTC; further the engineer battalion command group and HHC tested the proposed Engineer Restructure Initiative (ERI) command and control structure.[4]

In late October 1990, in preparation for the 1st AD Battle Command Training Program (BCTP) in January 1991, the unit commanders and the battalion command group participated in Swift Lancer III, a computer driven exercise conducted to evaluate command and control (C^2) and execution of offensive operations over extended distances in excess of 250 km. Again the ERI command and control concept was used as a test bed for the eventual activation of ERI type units in heavy divisions.

By this time, the 16th Engineer Battalion had completed a successful CMTC rotation with three of its four line companies, the HHC evaluation had been completed at the CMTC, and the battalion command group/staff and company commanders had participated in pre-BCTP training. Additional BCTP prep and field training exercises (FTX's) were scheduled for November and December 1990 for work on training shortfalls before the division's January 1991 BCTP evaluation.

One such shortfall was the units earthmoving capability. The battalion turned in sixteen D7F bulldozers and received 27 (25 MTO&E and two operational readiness floats) new M9 Armored Combat Earthmovers (ACEs). The new equipment training (NET)

program began in late September 1990 and ended the last week in October 1990. At most each ACE operator received about 15-20 hours of actual hands-on operation on the equipment. This would soon change with our experience in Southwest Asia (SWA). From the beginning the battalion experienced customer support problems with its maintenance unit for the M9 ACE. The supporting maintenance unit did not have manuals, tools, and repair parts to support this new addition to the division's inventory. Most needed repair parts were roadwheels, bumper stops, and suspension arms. None of these items were readily available in SWA.

PREPARATION FOR DEPLOYMENT

The 16th Engineer Battalion was alerted to deploy to Southwest Asia as a part of the 1st AD on 9 November 1990.[5] This was a very hectic day; news concerning deployment of a unit from Europe spread like wildfire. Preparation for deployment to Southwest Asia began immediately. The battalion immediately activated its Family Support Group Program. This program provided a sense of unity and lifted the morale of both family and unit members during this period of high anxiety. In addition, standing operating procedures (SOPs) were dusted off, family care plans verified, medical boards conducted, preparation for overseas movement (POM) process activated, and Staff Judge Advocate (SJA) activities initiated. Personnel and equipment were prepared for shipment. Personnel shortages were continually filled with replacements from units remaining behind in Germany.

Some equipment shortages were taken from war reserves stocks--combat engineer vehicle (CEV) and armored vehicle launched bridge (AVLB)--while other shortages were filled with equipment from engineer units in Germany. The only major piece of battalion equipment at modified table of organization and equipment (MTO&E) strength was the M9 ACE. Material to construct armored vehicle launched mine clearing line charges (AVLM) could not be purchased in time for shipment to Southwest Asia. Contract arrangements were made in Southwest Asia to have 1st Cavalry Division (CD) procure the material for AVLM assembly once in Saudi Arabia.

The Corps and Division Commanders laid out their training focus shortly after the 9 November announcement on deployment to SWA. Units emphasized gunnery and weapons skills, NBC (nuclear, biological, and chemical) training, command and control of large formations, desert survival, and host country customs.[6] Some of the training information came from the Center for Army Lessons Learned (CALL) or from after action reviews (AARs) of units who had recently deployed to Southwest Asia.

The 1st AD sent a pre-advanced party to Saudi Arabia to gather additional orientation material and to conduct reconnaissance and set up a reception operation at the seaport of debarkation (SPOD) and aerial port of debarkation (APOD). This reconnaissance effort allowed the advanced party to see first-hand the harsh desert conditions, and the lack of supporting facilities. They gained valuable insights from their fellow

commanders already in theater (XVIII Airborne Corps, 24th ID(M), and 1st CD) on deployment and desert operations.[7] In addition, they decided on a location for the initial tactical assembly area (TAA) and conducted limited tactical planning and support coordination. Two representatives from the Assistant Division Engineer (ADE) cell accompanied the Assistant Division Commander for Support (ADC-S) to provide engineer expertise as needed. They returned in early December 1990 with as much intelligence about the area as they could gather in their five days on the ground.

The rear detachment OIC (senior captain) and NCOIC (senior E6) for the 16th Engineer Battalion were selected by 1 December. They began to inventory installation property, initiate hand receipts, and secure soldier personal items in a centralized billet area. The transition to the rear detachment occurred on 18 December 1990. Soldiers and families alike had a lot of mixed emotions during this period. Each of the six companies received a support group briefing, and various community agencies participated in each briefing. Families were told to anticipate their husbands being gone for at least one year. Johnson Barracks, the Kaserne the battalion occupied, was about 75% vacant once the unit departed. One of the good lessons learned concerning rear detachments was to interface it with the community Family Assistance Center (FAC). The rear detachment officer was required to attend a weekly community meeting; so he

kept the family support group appraised of all information affecting the battalion or its soldiers.

DEPLOYMENT

The 16th Engineer Battalion began its deployment to Southwest Asia on 3 December 1990. We transported unit equipment to the SPOE (Bremerhaven) by train, barge and wheel convoy. The advanced party of 14 soldiers, 2 wheel vehicles and M577 flew from Rhine Main Airfield on 14 December 1990. The companies deployed as follows:

a. HHC, B and C Companies - 23 December 1990

b. A, D and E Companies - 25 December 1990

The battalion deployed approximately 900 soldiers and 450 pieces of equipment, including wheel and track vehicles. In addition the battalion shipped 15 twenty-foot military-owned demountable containers (MILVANs) of equipment and supplies.

The advanced party, primarily the ADE cell and the battalion S-3 and support personnel, moved directly from the APOD to TAA Thompson, approximately 550 km out along main supply route (MSR) Dodge which parallels Tapline Road (see Figure 1). Battalion units fought the deadly traffic on the crowded Tapline Road heading west into the desert, just southeast of Hafa al Batin near King Khalid Military City (KKMC). The remainder of the battalion, approximately 875 soldiers, moved through the APOD, loaded buses and departed for the Intermediate Staging Area (ISA) at Al Jubayl, the SPOD site. At Al Jubayl, our soldiers

were quartered in the "Dew Drop Inn--Tent City" in large GP tents erected on concrete pads. The soldiers arrived in the ISA from 23-29 December 1990. Thirteen of the battalion soldiers travelled as "supercargos" that accompanied the equipment being transported on ships. The 16th Engineer equipment shipped by sea was used as cargo filler and dispersed among fourteen different ships. This was very frustrating after the division TPFDL put the battalion up front in its priority. It created problems in accounting for keys and security of vehicles, which in some cases contained crew-served weapons, high value dollar items, and personal equipment and baggage.

The first few days in Tent City were spent in acclimatization and securing transportation to move back and forth between the port of Al Jubayl and the ISA, which was six miles away. Security of the Tent City site was first priority, since access to the perimeter was open to anyone passing near the area. The ISA was dusty, crowded (10,000 or more soldiers crammed 16-20 persons in each tent), and often unsanitary. In many ways, the ISA prepared soldiers for desert life because it forced them to face up to problems with dust, moisture, sanitation, and maintenance. Everyone learned that discipline was a prerequisite for survival in the desert. Contracted food ranged from acceptable to poor; it caused some illness. Daily meetings helped to track ship arrival, update progress on set up of TAA Thompson, and monitor troop arrival. The emphasis on individual training continued as leaders held classes on desert

survival skills. Once the division began to bring additional personnel into Saudi Arabia, Tent City began to exceed capacity. Temporary lodging was then established at the port for some division soldiers. All 16th Engineer Battalion soldiers were billeted in Tent City. Sanitation conditions were below standard, so field sanitation became a high priority on the field sanitation team daily checklist. Hastily constructed wooden showers and latrines were the norm. Bits and pieces of our equipment began to arrive around 5 January 1991. A paint shop was established at Tent City to apply Chemical Agent Resistant Coating (CARC) paint to vehicles. Those vehicles designated for desert camouflage painting were run through this shop before heading west to TAA Thompson.

Track vehicles were placed on heavy equipment transporter (HET) vehicles, and each unit's vehicles were assembled in convoys for the long road march to the TAA. The last company of the battalion cleared Tent City around 20 January 1991. The MILVAN containers did not arrive at the SPOD until late January 1991, and only 12 of the 15 containers could be loaded. A small element from the battalion S-4 and battalion maintenance officer (BMO) section remained at port to provide liaison between the battalion and the division movement control cell; they tracked missing equipment and assisted in locating low density repair parts. Three of the battalion's M916 tractor and trailer rigs made continuous runs between the port of Al Jubayl and the TAA from mid January to mid February 1991.

PREPARATION FOR COMBAT

The battalion's advanced party had laid out the division area in a circle (see Figure 1) with a diameter of approximately 25-30 miles. The maneuver brigades were placed on the outer perimeter; the remaining division assets were spread out inside the TAA. The layout of the TAA was based on the Global Positioning System (GPS) for accuracy. The GPS made up for the lack of accurate maps and absence of terrain features in the desert; it facilitated precise coordination of tactical ground forces and aircraft.[8]

Upon arrival in the TAA, engineer work started immediately. We dug in tactical operation center (TOC) facilities and bermed around petroleum, oil and lubricants (POL) facilities. The 9th Engineer Battalion, 7th Engineer Brigade, was initially on the ground providing support to 1st AD before the 16th Engineer Battalion equipment arrived. The Battalion TOC was functional around 10 January 1991. Engineer effort centered around survivability and sustainment operations. All companies were closed in the TAA by the third week in January 1991. The 9th Engineer Battalion was released to 7th Engineer Brigade on or about 12 January 1991. The ADE section collocated with the Division Main, and the 16th Engineer Battalion TAC (tactical command post) collocated with the Division TAC. The assistant S-3 ran the engineer battalion TOC. The battalion executive officer ran logistics, maintenance and personnel operations for the battalion.

Shortly after the air campaign began on 17 January 1991, the division was alerted to expect possible sabotage from infiltrators. We placed security around the main C^2 elements. The 16th Engineer Battalion was given the mission of providing security for the Division TAC, Division Main CP and Aviation Brigade. One company was assigned to provide security for the Division TAC, one for each of these main CP's, and two companies provided security for the Aviation Brigade and its aircraft. This task continued until 24 January 1991.

Before the battalion had completely closed in TAA Thompson with its heavy equipment, it received its first contingency mission. The division was located less than 60 km south of the Iraqi border. As divisional units arrived in the TAA, they were placed under the control of the 3rd Brigade Commander, Task Force (TF) Zanini, to spearhead the projected assault to blunt a pre-emptive strike down the Wadi al Batin toward KKMC. The engineer work focused on creating survivability positions and protective berms. Additionally, the battalion had around 80% of its M113A2 personnel carriers with M2 .50 cal machine-guns and AT4 antitank weapons, which were obtained as a part of the engineer basic load.

The organization for combat during the preparation for the combat phase of the operation called for a line company to support each maneuver brigade, for one line company to provide general support to the division, and for the bridge company to provide Class V haul with bridge pallets configured to haul

cargo. The ad hoc ERI arrangement could not be emplaced at this point, because there were not enough engineers in theater to allocate additional engineer support to each divisional unit. During the first three weeks of January 1991, there were no additional engineer assets provided to 1st AD.

Meanwhile, the battalion continued to obtain much needed Class V supplies from LOG BASE Alpha. Air and ground reconnaissance of the Wadi al Batin was conducted for possible crossing sites leading to the divisions forward assembly area (FAA). The division crossed the Wadi al Batin and MSR Sultan, the road from Hafa Al Batin to Riyadh, on 14 February 1991. The three maneuver brigades moved on line in formation; each brigade sector contained three-four crossing sites through the Wadi al Batin. Concurrently, in coordination with the 7th Engineer Brigade of VII Corps, eighteen bermed crossing sites were erected over The Arabian Pipeline, which parallels Tapline Road. The 7th Engineer Brigade used scraper pans and D7F dozers from the 249th Combat Heavy Engineer Battalion to erect the berm crossings. The division reassembled in staging area MAC after crossing the Wadi al Batin. The two-day, 165 km move from TAA Thompson to FAA Garcia (see Figure 2) was part of a VII Corps exercise that oriented the Corps to its attack sector and rehearsed battle formations and command and control.

On 25 January 1991, the 54th Engineer Battalion joined the 1st AD for combat operations. TF 16 aligned itself with the lead brigade of 1st AD. and TF 54 aligned itself with 2nd Brigade of

1st AD. Each engineer battalion provided one company to the 3d Brigade, 1st AD. Also an Engineer Task Force (TF Wildcat) was created, with the 3d Brigade Engineer acting as the TF Wildcat commander. On 10 February the 19th Engineer Battalion (Corps) (Wheeled) was attached to 1st AD; it performed general engineer support for 1st AD until 4 March 1991.

These additional engineer units in 1st AD sector fostered the creation of an ad hoc ERI structure, minus the engineer brigade staffing. The ADE cell and the 16th Engineer TAC element handled the increased workload of monitoring all engineer statistics and dispatching tasks between units. The 16th and 54th Engineers cross-leveled equipment and personnel to create an engineer TF (TF Wildcat) to support the 3rd Brigade, 1st AD. The 19th Engineers formed the base for the sustainment engineering needed to support MSR construction into Iraq. The division also received an Engineer School consultant who aided with tactical concepts. The CG of the 1st AD agreed to this arrangement, but the Division Engineer responsibility remained with TF 16 Commander. The Engineer School consultant initially operated out of the DMAIN during the preparation for combat. He operated out of the 16th Engineer TAC, collocated with the Division TAC, as an engineer advisor during combat operations.[9] Each battalion was commanded by a lieutenant colonel, and TF Wildcat was commanded by a senior major.

During this period the battalion received its AVLBs and steel-wide flange sections to construct AVLMs. Despite shortages

of materials, periodic sandstorms, and shortages of welders, the battalion modified sixteen AVLB chassis to carry two MICLICs apiece.[10] The seventeen ton bridge was dismounted and replaced with two 2,500-pound MICLIC charges. This increased vehicle speed and decreased breakdowns, providing greater mobility and survivability.

The division completed its division movement rehearsal to FAA Garcia and conducted pre-combat checks for ground operations in Iraq. During this movement, the 19th Engineer Battalion, along with the bridge company minus, "Team Digger", marked the crossing routes for each brigade through the Wadi al Batin.

The three to four weeks of in-theater training the corps' units were able to conduct really built the troops confidence. At first, units were concerned with simply establishing themselves in their assembly areas and getting used to desert life. After three or four weeks, however, as VII Corps commander Lieutenant General Frederick M. Franks Jr. put it: "Our soldiers were desert smart and desert tough. Our soldiers were magnificent at being able to adapt to the desert--much to the surprise of the Iraqis."[11]

COMBAT OPERATIONS: BATTLE NARRATIVE SUMMARY

The engineer task organization, mission, and intent for 1st AD during the ground campaign was as follows:[12]

1st BDE	2nd BDE	3rd BDE
TF 16 EN (DS)	TF 54 EN (DS)	TF WILDCAT (EN)(DS)
B/16 EN (-)	A/16 EN	C/16 EN
D/16 EN	A/54 EN	D/54 EN
B/54 EN	C/54 EN	
	DIV TROOPS	1-1 CAV (OPCON 1 BDE)
	TF 19 EN	1/B/16 EN (ATT)
	TM DIGGER	

Mission: G+1, H-Hour, Engineer Task Forces 16, 54, and WILDCAT conduct mobility, countermobility, and survivability operations to facilitate the 1st Armored Division's movement to contact to locate and to destroy enemy forces in zone and secure ATTACK POSITION PYTHON. Rearm, refuel, and refit and prepare for future operations to gain contact with and destroy the RGFC.

Engineer Intent: The keys for a movement to contact are mobility and flexibility. I want engineer assets positioned to provide both without causing the division to "break stride". Engineers should be well forward to provide route maintenance, in-stride breaching, and breach/bypass marking. Accurate and timely reporting of anything that could slow the movement of 1st AD is critical. As we move North, I want us to be able to protect our flanks using rapid mining techniques. Upon closure in ATTACK POSITION PYTHON we must be prepared to provide engineer support to execute either a coordinated attack East or North or a hasty defense to destroy the RGFC.

Chronology

23 February 1991, G-1

TF 19 Engineers staged earthmoving equipment within 6 km of the Saudi Arabian-Iraqi international boundary berm. This berm served as the Line of Departure (LD). Coordination was made with the 82nd Engineer Battalion in direct support (DS) to the 2nd Armored Cavalry Regiment (ACR), forward of the 1st Armored Division, for an assembly area and a cooperative effort to

combine resources to reduce the berm. Sixteen dozers were poised to breach the berm to facilitate the division's maneuver (wedge) formation (see Figure 3).

The LD consisted of two berms approximately 15 feet in height. At the base, the berm was a maximum of 21 feet wide. Berm slope did not exceed 57%, berms were separated by approximately 15 to 17 feet. Soil condition of the berm was unpacked rocky sand. Two existing gaps were identified. A 2nd ACR reconnaissance team verified that there were no obstacles leading to or between the berms.

Engineer Task Forces 16, 54, and WILDCAT continued to plan, perform maintenance, conduct pre-combat checks of individuals, vehicles, and equipment, and rest in anticipation of the on order mission to execute the division's movement to contact/attack plan. Team Digger prepared for its move, uploading Class IV and V. The construction materials, mostly wire and pickets, were later used for EPW detention areas.

24 February 1991, G-Day

The ground war began with the coalition forces crossing the line of departure before morning nautical twilight (BMNT), approximately 0532 hrs. At approximately BMNT+1, TF 19 Engineers began their breach of the berm with 16 bulldozers. Hastily, units were alerted to be prepared to move on or about 1200 hours. All units reached REDCON 1 by 1100 hours and rolled towards the LD by 1200 hours. The 1st AD moved in a wedge: 1st BDE lead,

2nd BDE followed left, 3rd BDE followed right, and Force Artillery followed 1st BDE center of zone.

Shortly after noon, a 2nd ACR terrain spot report indicated a large escarpment hindering trafficability for wheels and tracks. The division wedge formation shifted right (east) to allow the 2nd BDE maneuver space. At 1140 hours, TF 19 Eengineers reported 45 lanes constructed through the berm. First Platoon, Company B, 16th Engineer Battalion, in direct support to 1-1 Cavalry Squadron (CAV), crossed the LD at 1434 hours. By mid-afternoon, more than 250 eight-meter lanes were constructed along the division's 18 km front, which parallels the Saudi Arabia-Iraqi berm.[13] Second Platoon, Company C, 54th Engineer Battalion began construction of a logistical route marking system for 2nd BDE; this activity continued throughout the battle and proved to be invaluable to the brigade logistic elements.

At approximately 1450 hours, an NBC team traveling in a Fuchs NBC reconnaissance vehicle dismounted in the vicinity of the LD (berm) and encountered an unexploded ordnance device. One of the soldiers, not familiar with the device, threw a rock at it and detonated it, causing injury to all three soldiers. This was the first of many incidents with unexploded ordnance (UXO; i.e. DPICM, CBU, MLRS); some of the latter ones became deadly.

CG, 1st AD requested marking the passage lanes at the berm for night crossings by follow-on forces. TF 19 Engineers complied, but ran short of chem-lites. Timely coordination with

TF WILDCAT resulted in a successful hand-off of additional chem-lites in order for TF 19 EN to complete the lane marking mission.

An element of the 2nd ACR had not cleared the division's area of operations and had gone to ground. 1st AD lead elements held between phase line (PL) APPLE and PL VIRGINIA; they remained over night and conducted refueling operations. No significant contacts were reported. TF 19 Engineers reported MSR Orange construction proceeding at 30-35 km per day (see Figure 4).

25 February 1991, G+1

1st AD elements continued movement to contact at 0630 hours. Between the hours of 0830 and 1200, 1-1 CAV forward movement was slowed due to a large number of enemy prisoners-of-war (EPWs) surrendering. Reports of unexploded ordnance were numerous all day; ordnance is marked by sappers using various nonstandard methods.

The 3rd BDE made contact with elements of the 26th Infantry Division (ID). First Platoon, Company C, 16th Engineer Battalion executed lane clearing operations with M9 ACEs to clear through unexploded ordnance on approach routes to objective areas. Company D, 54th Engineer Battalion constructed EPW holding cages for approximately 100 EPWs.

The 1st BDE made contact with other elements of the 26th ID. Company D, 16th Engineer Battalion prepared to go forward and destroy bunkers; it encountered triangular shaped minefields. Tank plows supporting TF 1-7 Infantry breached the minefields and

the engineers followed; marking lanes through them. The 2nd BDE also fought elements of the 26th ID with no significant engineer missions.

The 4th BDE attacked enemy targets in the vicinity of Al Busayyah while the division continues to close on the objective town. An overnight artillery prep of Iraqi positions in Al Busayyah was conducted. In all, thirteen targets were destroyed.

Dispositions: 1-1 CAV screened from PL SMASH to PL NEW MEXICO; 1st BDE held vicinity PL NORTH CAROLINA in the east of zone; 2nd BDE held vicinity PL NORTH CAROLINA in the west of zone; and 3rd BDE held vicinity PL SOUTH CAROLINA in the east of zone (see Figure 5).

26 February 1991, G+2

At 0630 hours, 1st AD attacked enemy positions in Al Busayyah. 1st BDE attacked South, 2nd BDE attacked North, and 3rd BDE prepared to exploit success and passed 1st BDE to Southeast and continued the attack in zone, while 1-1 CAV screened from PL NEW MEXICO to PL TEXAS.

The most significant action involved 2nd BDE elements. After a thirty-minute artillery prep, the brigade moved through the town and pasted it, knocking out several T-54/T-55 tanks. During the movement into Al Busayyah, Company A and the 1st platoon of Company C, both of the 54th Engineer Battalion, located minefields, reconnoitered, and marked them for safe passage for their respective task forces. A reinforced infantry

brigade dug in at the Iraqi logistical complex was discovered after the brigade had passed through the town.[14] It did not appear that the Iraqi soldiers in the town would surrender. A box around the town was defined, friendly forces cleared, and 2-1 FA fired into Al Busayyah. Afterwards, TF 6-6 Infantry was given the mission to clear the town, blow up bunkers, destroy all war stocks, equipment and material. Company A, 16th Engineer Battalion remained behind to accomplish this mission and fired 21 CEV 165mm HEP (high-explosive plastic) rounds into the town.[15] The town and Iraqi logistical sites were reduced to rubble. Five tanks, numerous wheeled command/control and support vehicles, bunkers and arms caches were destroyed by demolitions.

The 1st AD continued to move through the Al Busayyah sector with 2nd BDE in the North, 1st BDE in the South, and 3rd BDE trailing as division reserve. By 1200 hours, the division had turned east; it continued the attack to destroy Iraqi forces in zone. The 75th Artillery BDE (MLRS, 8 inch, 155mm) linked up with Force Artillery.

An intelligence report indicated that the Madinah Division Republican Guard Forces Command (RGFC) remained in defensive positions, oriented south-southeast with a mechanized brigade in the center and two armor brigades on the east and west flanks of the division. This orientation placed their rear and right flank directly in 1st AD's axis of advance. As the VII(US) Corps main effort, 1st AD attacked to destroy the Madinah RGFC vicinity OBJ BONN using maximum indirect fires of artillery, CAS, and attack

helicopters. Again, numerous unexploded ordnance and minefields were encountered and reported (only single grid coordinates given), but few were marked due to the speed of the advance.

Numerous contacts reported as the attack progressed east from PL CANADA. Seventeen tanks spotted vicinity PL TANGERINE at approximately 1624 hours were engaged by A-10s. By 1800 hours, lead brigades crossed PL TANGERINE. 1-1 CAV made contact with elements of the Tawakalna and 52nd divisions vicinity PL POLAND. Fifty-two tanks were identified. Air scouts and AH-1s stayed on station while air strikes and artillery destroyed thirty tanks. 3rd BDE conducted attacks to destroy twenty-two tanks and many armored and wheeled support vehicles, while AH-64s and CAS attacked targets vicinity OBJ BONN (see Figure 5).

27 February 1991, G+3

During the early morning hours, 1-1 CAV reported their TOC and ALOC had been damaged by incoming fires--several were wounded. Sappers from Company C, 54th Engineer Battalion were engaged by friendly fire at Umm Hajul Airfield--one killed in action (KIA) and one wounded in action (WIA).

Still more unexploded ordnance was reported and another detonation injured three soldiers from 3rd BDE. Maneuver brigades reported shortages of fuel: one to two hours of fuel on tanks, none in HEMTT (heavy expanded mobility tactical truck) fuelers. VII(US) Corps pushed emergency fuel forward to 1st AD. 3rd AD sent 20 HEMTT fuelers. The brigades conducted cross-

leveling operations. Later on in the morning, engineer TFs 16 and WILDCAT construct EPW holding cages for 1st and 3rd BDEs, respectively. By early afternoon, 1st AD elements held their current positions; conducted refuel, rearm, and refit operations, as necessary. Engineers began to clear buildings, blow up bunkers, and destroy all enemy war stocks in the area.

28 February 1991, G+4

On order, 1st AD continues the attack. The CG directed "I want an artillery prep that is to be the most awesome ever known to man."[16] The artillery prep begins approximately 0522 hours and concludes at 0615 hours, with an AH-64 battalion raid on OBJ BONN. Ground forces attacked at the conclusion of the Apache raid, at approximately 0630 hours. Targets located in OBJ BONN were reported to be elements of the Madinah RGFC.

Maneuver brigades crossed PL ITALY, three brigades abreast at 0700 hours. Contact was gained with the Madinah forces; deteriorating units were reported fleeing northeast towards Basra, Iraq. Two brigades of the Madinah's were destroyed. Cease fire was called at 0800 hours. 1st AD disposition was along PL ITALY: 2nd Bde North, 1st BDE in the Center, 3rd BDE in the South. 1-1 CAV sets in a lager area to the rear of PL ITALY (see Figure 5).

The 1st AD mission was to assume a defensive posture; be prepared to continue offensive operations; wartime rules of engagement remained in effect; MOPP level was zero.[17]

Shortly after the cease-fire order on 28 February, engineers began one of their most significant contributions to the ground campaign--the destruction of large quantities of abandoned Iraqi equipment and munitions. On 2 March 1991 at Safwan Airfield, the cease-fire negotiation site, General H. Norman Schwarzkopf, the Central Command (CENTCOM) Commander-in-Chief reiterated his earlier guidance to destroy it all and ask for whatever explosive ordnance disposal support was needed.[18] Additionally, units began to collect personnel and equipment missing since crossing the line of departure. Unexploded ordnance claimed the life of a sapper from Engineer TF 19 within hours after the cease-fire.

POST COMBAT OPERATIONS

Following the cease-fire order announced on 28 February 1991, the 16th Engineer Battalion immediately began to construct several EPW encampment areas and assisted two of the division's check points in providing humanitarian assistance to Iraqi refugees in Northern Kuwait and Southeastern Iraq near Basara. On several occasions, the battalion used its bridge trucks to haul EPWs into Saudi Arabia; on return trips, they delivered demolitions from LOG BASE Echo. Bunker complexes were destroyed with ACEs, and a grid zone reference system was established to systematically destroy Iraqi ammunition, military equipment, civilian construction equipment and buildings used for military purposes. Between 1 March 1991 and 12 April 1991, 1st AD

engineers destroyed approximately 8990 short tons of captured Iraqi munitions and also destroyed 447 captured Iraqi vehicles (Appendix A).

During this portion of the operation, the battalion had ample opportunity to conduct training in a number of key areas. Extensive training in demolitions, map reading, communications, and desert maintenance operations were conducted. An unusual training opportunity for combat engineers developed. Bravo Company, 16th Engineers repaired the damaged Rumaylah Airfield which was capable of handling C-5 aircraft. Once the airfield damage had been repaired, C-130 aircraft hauled supplies forward and evacuated EPWs on return flights to Saudi Arabia. The airfield was eventually turned over to 1st ID(M).

On 12 April 1991, the battalion, along with other elements of the division, started its movement from the Rumaylah Oil Fields in Southeastern Iraq to Camp Kasserine, a staging area established west of KKMC in Saudi Arabia to prepare for redeployment to Germany. The trip from Iraq to KKMC covered a distance of approximately 250 miles. Once the division cleared the Saudi Arabia-Iraqi border berm, the battalion sent eleven ACEs back to the border to close twenty-two lanes in the berm through which the division passed on its return to Saudi Arabia. As the 1st AD departed Iraq, every effort was made to bring all equipment and supplies out of Iraq and to restore the berm to its original state. All weapons were cleared, ammunition was inventoried and secured. Meanwhile, seven AVLBs were transported

with the advanced party to Camp Kasserine to establish hasty wash rack facilities to clean vehicles. The ADE cell and a company from the 54th Engineer Battalion designed and constructed The Town Center Complex at Camp Kasserine just west of KKMC. Although the living accommodations were still austere, many of the common comforts afforded soldiers in redeployment areas were available. A field Post Exchange (PX), personnel and finance service center, post office, game room, movie theater, and AT&T telephone center were all immediately available for soldiers who had endured the rigors of combat.

REDEPLOYMENT

On 15 April 1991, the 16th Engineer Battalion arrived at Camp Kasserine; with all personnel and equipment from Iraq. The remaining equipment at LOG BASE Echo was transferred to KKMC, and all ammunition was turned in to ordnance units.

The task of inventorying property, cleaning weapons and vehicles began. Unlike most 1st AD units, the 16th Engineer Battalion did not turn in its equipment to temporary storage sites in the vicinity of KKMC. Awaiting departure, the battalion conducted AARs, issued desert camouflage uniforms for the return trip to Germany, arranged transportation to the port of Ad Dammam, Saudi Arabia, packed MILVAN containers with equipment, cleared customs inspections and got some well deserved rest. One-third of the battalion departed Saudi Arabia through the KKMC air terminal. The remainder of the Battalion moved track and

wheel vehicles to Ad Dammam Port by the northern route (Tapline Road) 450 miles, and the southern route through Riyadh, Saudi Arabia, 800 miles. We only had one accident with a HMMWV (high mobility multipurpose wheeled vehicle) during convoy operations to the port.

At the port, vehicles were inspected and sensitive items were inventoried one last time. Living accommodations at Khobar Towers in Dhahran were excellent. Most soldiers had not used hot showers, running water, and commodes in four months. The soldiers at KKMC redeployed to Germany between 28 April and 2 May 1991. Air transportation from Dhahran was a little more complicated. The remainder of the battalion departed Saudi Arabia on 2 and 3 May 1991 from King Abdul Aziz Air Base in Dhahran.

POST SOUTHWEST ASIA OPERATIONS IN GERMANY

By 3 May 1991, most of the battalion's soldiers had departed Saudi Arabia for Germany. Thirty-three soldiers remained behind on a volunteer basis to help load the ships at Ad Dammam, Saudi Arabia. They were placed under the control of a senior NCO (E7) and were not expected to return to Germany for at least 90 days.

The welcome home was very emotional. When the aircraft dropped below the clouds in Germany, the soldiers cheered wildly to see green vegetation, trees and even rain. Most soldiers from the battalion had been away from home and their families for

almost five months. Some came home to a cheering crowd of well wishers, but others came home to broken families.

The battalion buses were all diverted to the gym at Johnson Barracks. There the families were waiting with flowers, baked goods and lots of hugs and kisses. The battalion commander arrived on the last plane from Saudi Arabia with 16th Engineer Battalion soldiers. Property, sensitive weapons and personal equipment were surveyed before soldiers were allowed to depart with their families. The VII Corps granted soldiers five days administrative leave to assist them in taking care of personal business and to re-adjust to family life. The battalion chaplain conducted family reunion training for all soldiers prior to our departure from SWA.

The Rear Detachment Commander and his group had performed in an outstanding manner during the absence of the battalion. They remained in control of the battalion's operations until the five days of administrative leave ended. For the returning soldiers, driving a car and sleeping in a bed seemed like memories of the distant past.

Once soldiers returned for duty, the battalion uncased its colors and conducted a welcome home ceremony on 10 May 1991 at Johnson Barracks. The community commander, mayor of the city and other important military and civilian workers were all invited. The ceremony was spectacular and the weather cooperated fully. The day was made more exciting with the presentation of several SWA ARCOM and Bronze Star medals to deserving enlisted soldiers

and officers. Family members witnessed the accomplishments of the battalion soldiers, which made the occasion personally gratifying.

The remainder of May 1991 was spent cleaning personal equipment, and reviewing the administrative procedures for releasing soldiers who were retained on active duty for deployment. Four of our soldiers participated in the Victory Celebrations conducted in the United States. Soldiers received a hero's welcome when they returned home to visit family and friends during their leave periods.

Once the battalion personnel were fully redeployed to Germany, the most exciting event for the battalion was the 1st AD victory celebration and change of command on 3 and 12 July 1991 respectively. The division victory celebration on 3 July 1991 was a spectacular event; many US and German dignitaries helped to celebrate the division's return to Germany. The 16th Engineer Battalion and 54th Engineer Battalion participated in the ceremony, and both performed superbly. The division change of command on 12 July was equally as spectacular. We regretted seeing the division commander depart, the battalion felt a special sense of pride based on our Gulf War experiences with him.

The 33 soldiers who remained in SWA for port support duty returned to Germany on 7 July 1991. The remainder of July 1991 was spent cleaning up the Kaserne and preparing for the return of vehicles and equipment from SWA. Most of the battalion's

equipment returned to Germany in late July and August 1991. All vehicles were returned, except for two 1.5 ton trailers and a M113A2 armored personnel carrier (APC). The APC was found and returned a few weeks later. The two 1.5 ton trailers were never found. All MILVANs except one were returned to Germany within eight months after our departure from SWA. One of the AVLBs hand-receipted to the Egyptian Army was never returned in SWA. In all, approximately 161 reports of survey were initiated from SWA, with a total value of over two million dollars. Many of the vehicles were not secured following customs inspection at the port, and many valuable items and personal clothing and equipment were stolen.

Most American units cleared the port so quickly that good supply accountability and discipline procedures were ignored. This haste contributed to the waste of government property in some cases. Maybe that's the price of doing business in war.

ENGINEER OPERATIONS (DOCTRINE vs. DESERT STORM EXPERIENCE)

The transition to task force organization was greatly impeded by the slowness in allocating additional engineer battalions to 1st AD. Although we asked immediately for additional support after the formal announcement on 8 November 1990, no firm commitment for support was specified until three weeks before the ground campaign. Nevertheless, the planning for the division was flexible enough to accommodate additional engineer battalions. The fact that the division had trained for

over five years to form task forces with other corps level units greatly aided the addition of other units.

The new engineer restructure initiative is described as follows:

> Major changes under the engineer restructure initiative include improved command and control, an improved logistics organization, and an experienced engineer commander habitually supporting multiple maneuver echelons: task force, brigade, division, and corps. It eliminates the need to create ad hoc command and control headquarters within the division area for the maneuver brigades and streamlines the engineer communications flow. This improved structure allows the engineer organization to effectively task organize for combat in the same manner that infantry and armor organizations task organize, by adding and subtracting subordinate elements from a relatively fixed headquarters base.
>
> The division sapper battalions are designed to be focused 80 percent on mobility and 20 percent on countermobility, survivability, and sustainment. The division engineer commands or controls the organic sapper battalions and corps combat engineer assets in the division area. The corps usually places at least one battalion in a command relationship to the division to provide support. A sapper battalion now supports each committed maneuver brigade. Under most conditions, the sapper battalion headquarters will continually train and operate with its associated ground-maneuver brigade. The distances over which its subordinate elements operate are reduced to one brigade's area as opposed to past practice that spread an engineer battalion over several brigades.[19]

Division engineers are organic to the division, not to the brigades or task forces. Additionally, this engineer structure provides command and staff at each maneuver echelon comparable to the other members of the combined arms team. As the engineer special staff officer, he is responsible to the division commander for all engineer-related matters in the division's area of operation. He remains the division engineer

regardless of the rank of the senior corps engineer unit commander in the division area. Engineer platoons work most efficiently under the control of an engineer company, and engineer companies work most efficiently under the control of an engineer battalion.[20] Moving one echelon lower, the sapper battalion commander is the brigade engineer and advisor to the maneuver brigade commander on all engineer operations in the brigade. This complements the new division engineer structure and puts a more experienced senior commander in the brigade area.

One area that needs further attention is engineer platoon structure. Experience from Desert Storm revealed that engineer platoons are not properly equipped to conduct mobility operations. The current equipment allocation hinders the platoon's ability to support an armored division in rapidly changing offensive operations. The M113A2 APC (engineer squad vehicle) is not large or fast enough to adequately support an armored combat team. Attaching a trailer to the APC is not a solution; the trailer hinders movement and compounds the problem. Additionally, counter-obstacle equipment should be organic to each platoon and not cross-attached based on mission, enemy, terrain, troops, and time available (METT-T). The M113A2 APC has two major shortcomings: size and speed. These factors hinder an engineer platoon's performance in supporting an armored Task Force. The trailer has no business forward of the trains area on the battlefield; it is not a solution for the engineer squad's lack of space for carrying Class I, IV and V supplies. The

MICLIC trailer is also an impediment to mobility. Cross-attaching CEVs, AVLBs, and AVLBs among platoons disrupts command and control of the Assault and Obstacle Platoon.

One option is to provide engineer vehicles that are larger and faster; that would allow them to effectively support an armored Task Force. A modified version of the M2 Bradley would allow the engineers to haul all necessary equipment and demolition and provide them the speed necessary to stay with the armored Task Force. The assault and obstacle platoon also requires upgrade. An M1 chassis should be used for both the AVLM and AVLB, and the CEV should be replaced by an M1 chassis version of either the Soviet armored engineer tractor (IMR) or British combat engineer vehicle. The CEV transmission and final drives were not designed to sustain the loads of pushing dirt. If the CEV remains in the inventory, then its hydraulic rams should be hardened and its blade should be reinforced and configured in a V-shape.

The task organization of engineers in the 1st AD was a winner. There is no other adequate structure for placing sufficient combat engineers, properly armed and equipped, on the modern battlefield in support of a division.[21] Ultimately, ERI will provide better command and control of engineer assets by placing an engineer battalion in each maneuver brigade.

MOBILITY

Mobility operations call for breaching both friendly and enemy minefields and obstacles, maintaining MSRs, and facilitating gap crossings.[22] Fully committed, a division will normally require at least two corps combat engineer battalions and a combat support equipment (CSE) company to augment the organic engineer battalion. Lead brigades are normally task organized with at least one battalion of combat engineers to provide mobility support in the offense.

Engineers are well forward in the attack formation as an integral part of the combined arms team. They help maintain the momentum of the attack through counterobstacle operations. Having the preponderance of engineers forward is critical to the success of both the current and subsequent phases of the operation.[23] Even though we conducted only limited mobility operations, engineers were deployed well forward; they were configured to facilitate quick, easy transition to breach teams.

The only mobility shortfall came in the brigade support area/division support area (BSA/DSA). The wheeled vehicles in the BSA often had difficulty in rough terrain; they needed several cleared lanes to keep moving.

Task organization could be improved in only two ways: Preferably, engineer platoons would join with company teams. Or an engineer company pure could be developed behind the lead company team. Options for BSA mobility are to assign the

engineers with the lead company team the mission of clearing routes for follow-on trains (preferred) or to leave assets (ACEs) with the BSA.

SURVIVABILITY

Survivability operations consist of preparing fighting and protective positions that allow the division to survive to fight again and again.[24] Doctrine in Army field manuals provided excellent guidance for engineers on survivability. The following excerpts from FM 5-103 demonstrate how applicable doctrine was to operations in the desert.

> The concept of survivability on the ALB includes all aspects of protecting personnel, weapons, and supplies while simultaneously deceiving the enemy. Survivability missions enhance the total survivability of the force through fighting and protective position construction. Counterfire from enemy artillery is the most frequent threat to artillery units. Dug-in positions or parapet positions, as well as existing terrain and facilities, can provide protection. Major logistic systems and POL facilities need physical protection and built-in hardening.[25]

Life support (showers, sumps, latrines, and dive trenches) could not have been provided with more efficiency and effectiveness than what was provided by the SEE (Small Emplacement Excavator). The SEE was used to dig most personnel survivability positions. ACE teams worked both survivability and fighting positions. The marl rock surface caused some difficulties for the SEE. Engineers provided no camouflage operations support. The 1st AD did not receive desert camouflage nets and uniforms.

The SEE really enhanced BSA security. We did not waste valuable time preparing individual fighting positions with manual labor, so logisticians were free to better support their supported units.

COMMAND AND CONTROL

The division engineer uses his staff to command and control the engineer effort in different ways in each division. Sometimes the division engineer is located near the DTAC when fighting the close fight, while the ADE is the staff planner at the DMAIN.[26] The 1st AD used this method. It worked very well and facilitated the smooth transition of other engineer assets into the division.

Corps Engineers, from the 19th Engineer Battalion and the 54th Engineer battalion, were integrated into division rear support and maneuver elements. The 19th Engineer Battalion (wheeled), with elements of the division engineers and commercial equipment, was in direct support (DS) of DISCOM and focused on MSR maintenance and rear area engineer sustainment missions. The 54th Engineer Battalion (Mech) was DS to the 2nd maneuver brigade and integrated with combined arms training. An effort was made to ensure their quick closure into the division by providing SOP's, frequencies (call signs), and navigational equipment. Incoming units were guided by a sponsor unit (16th Engineer Battalion) until they could assume their part of the mission. The units conducted whatever coordination and training they could

in the short time between equipment arrival at the port and the LD time. The 54th and 16th Engineers formed three task forces, each complimented with a corps and heavy division engineer company.

One area that required special emphasis was the sustainment support for the division rear area. The division engineer needs a combat support equipment company. Numerous MSR constructions, route clearance operations, earthen bunker destructions, and life support trenches were accomplished by engineer units. Within the division, the requirements for construction equipment overwhelmed the capacity of the engineer battalions in the division. Many missions, such as MSR construction, are impossible to accomplish with equipment on hand. The division needs heavy engineer construction assets to support logistical and life support missions. Graders, dozers, and additional haul and digging assets are needed.

There is an absolute need for one CSE company to support each divisional engineer organization. Or these assets must be available in the engineer battalion configuration for apportionment by the sapper battalion commander based on METT-T.

FIGHT AS INFANTRY

Engineer units historically have had the secondary mission to fight as infantry.[27] This mission still exists for combat engineer units. Engineer units employed as infantry do not have the same capabilities as conventional infantry units. While

engineers fight continually as engineers, their employment as infantry requires serious consideration. Any commander who owns engineers in a command relationship, unless otherwise prohibited, has the authority to employ them as infantry. He bases the decision to use engineers as infantry on METT-T factors and through prioritizing the most critical engineer unit contribution.

1st AD Frago 9-91 tasked the engineers with providing a security element (company size) for the DTAC, DMAIN, and 4th BDE. This frago was cut as the battalion was just beginning to build combat power in TAA Thompson. Critical time that could have been used to train, refine load plans, and conduct logistics operations (maintenance, ammunition draw) was lost. Each of these command posts required one company of engineers (DTAC, DMAIN), and 4th BDE required two companies. These companies were tasked to move on a four hour notice away from their parent unit for approximately 10 days.

Higher headquarters needs to anticipate security requirements and make them part of the command posts (organic). They should utilize elements such as the division band and MPs, or rotate this requirement equitably among other divisional units. Valuable operational time was lost due to this requirement.

COUNTERMINE OPERATIONS

The U.S. Army has not fielded a single new countermine system since World War II. Thus in Desert Storm the only available allied countermine devices were rollers, plows, explosive line charges, rakes, and hand-held mine detectors. Although modified by many years of repetitious programs that reworked past technology, they were the same basic systems used in World War II.[28] Rather than allowing the success of Desert Storm to obscure our needs, engineers should use this opportunity to demonstrate that combat engineer systems development has not kept pace with that of other combat systems. It appears the Battle Labs will become TRADOC's focal point for all high technology systems combat development. All the attention given to these labs, along with our weak countermine strategy, will guarantee that the Army will once again ignore the need for countermine capabilities. Therefore, engineers must take immediate steps to influence Battle Lab development. Engineers must ensure that within Battle Labs there is an understanding that the Gulf War was an anomaly. The probability of the next war being like Desert Storm is very low.[29] Our only available systems are rollers, mine detectors, probes, and visual detection.

A significant factor in the Iraqi obstacle package was an abundance of mines owned and employed by the Iraqis. The Iraqis had developed considerable experience in obstacle preparation and had accumulated an extremely large inventory of the world's land

mines following its eight year war with Iran. Estimates indicate the Iraqis may have placed over 2.4 million antitank and antipersonnel mines in its primary obstacle belt in Kuwait and Iraq.[30] To obscure our shortfall in countermine training, the Engineer School provided mobile training teams (MTT) to deploying units in late 1990 to address shortfalls in mobility, countermobility, survivability, and sustainment. One area identified as being especially poor was mine warfare. Problems existed both in our familiarity with and employment of U.S. mines, as well as our identification and neutralization procedures for threat mines. The Army Engineer School, with the assistance of the U.S. Army Foreign Science and Technology Center, published the Mine Recognition and Warfare Handbook to assist units in identifying and describing Iraqi mine employment tactics and in suggesting effective neutralization procedures.

Despite such stop gap measures, engineers have no suitable mine detection capability that can adequately support an armored force. Visual mine detection, even with the aid of M1/M2 thermal sites, does not significantly satisfy our requirements. Tank rollers are not suitable for a hasty breach due to current transportation assets (M916 tractor-trailer) and mounting time.

Tank rollers must be mounted on tanks before LD; they should not reduce tank maneuverability. Engineers need some kind of mine detection capability to aid in obstacle intelligence and breach site selection.

OBSTACLE MARKING CAPABILITY

The Army lacks a standard obstacle making system. It is astonishing that engineers were not prepared to mark the significant numbers of obstacles, especially unexploded ordnance, encountered in zone. The three major problems with obstacle marking are:

a. Soldiers are not familiar with the identification of dud, unexploded ordnance; i.e. DPICM, CBU, and MLR systems.

b. There was no common, easily recognizable marking system between elements of VII Corps or even within the 1st Armored Division.

c. There was no suitable means for rapid marking that was not resource intensive.

During Operation Desert Storm, no standard making system for lanes through minefields was agreed upon or used by VII Corps or within theater. Adequate supplies of markers to properly mark enemy minefields were not available. Numerous expedient methods were used by lead Task Forces, but they confused follow-on units. Hasty breach marking systems are not currently within the Army system. Deliberate marking systems such as HEMMS (hand emplaced minefield marking system) poles and the minefield marking system are outdated; they require too much time to mark a lane during in-stride breaches, and they provide no heat signature for M1A1s and M2s. The latest breaching doctrine states that:

> Initially, all lanes are marked with centerline, entrance, and exit markers. As required, markings are

> improved for follow-on forces and are eventually replaced with permanent fencing. The CLAMS allows rapid, remote marking of the breached lane that can be seen at night. It is only adequate for the initial assault and must be replaced and improved as soon as possible with a two-sided marking using the HEMMS or according to SOP. A critical requirement for the initial marking of assault lanes is to provide marking that buttoned-up vehicles and crews can see easily through smoke. Tanks and IFVs have infrared sights that can see heat sources through smoke. Centerline marking can use infrared chemical lights, railroad flares, or simple smoke pots made from cans filled with earth and diesel fuel.[31]

Training and Doctrine Command (TRADOC) should provide an Army standard for marking hasty assault, in-stride, and deliberate breach marking that recognizes the problems of resource intensive systems. Coordination must be made with maneuver units to ensure the marking system conforms to their needs and desires. Once the standard is set, we should develop a hasty marking system. As a minimum, centerlines must be marked with visual (both for day and limited visibility) and heat signatures. The system must be simple and small enough to be carried by an engineer squad. Furthermore, we must train with the expectation of the "dirty" battlefield littered with unexploded ordnance. This will certainly be a problem to contend with in any future conflict.

The doctrine for marking lanes is sufficiently vague that Corps, Division, and brigades all came up with different versions. The Corps scheme was quite elaborate and required many items, such as painted plywood panels and hundreds of chem-lights that we had trouble locating due to short supply. The HEMMS poles were all used or lost during a rehearsal move to FAA

Garcia. The HEMMS lights were too faint to be seen a long distance in the desert. The CLAMS markers were not very impressive. One idea for long range recognition of the entry point was to hang an orange vest or VS17 panel on a long pole made of several camouflage support poles assembled together (Appendix B). Another suggestion was to use reflective vehicle delinators to mark lane entrances. We had barbed wire, engineer tape, and pickets to mark the side of the lanes. A large supply of HEMMS poles with better lighting and lots of engineer tape would be the best solution.

BATTLE DRILLS

Engineer battle drills were well developed and rehearsed, especially in those units that linked up early with maneuver TFs. Upon link-up, engineers rehearsed engineer battle drills at every level. The combination of briefings, talk through/walk through, company/team exercises, and TF breach drills made units competent and confident of their ability to execute breaching drills. Early link-up and thorough rehearsals at all levels make battle drills under fire much easier and safer.

As part of the final preparation for the movement to contact operation, the division's leaders conducted a three-hour sand model rehearsal exercise at the Division Tactical Command Post (DTAC) for all commanders and key staff officers. Doctrine states that a rehearsal is conducted for the following reasons:

> Critical phases of the plan and the drills required to implement it should be rehearsed. Successful mobility activities require participation from various elements of the combined arms team. Rehearsals develop understanding of the plan and instill confidence in the soldiers and develop unity of effort.[32]

Going through a rehearsal of this magnitude and complexity was a great learning experience.

LESSONS LEARNED AND RECOMMENDATIONS

Deployment

1. OBSERVATION: Preparation for Overseas Movement (POM).

ANALYSIS AND CONCLUSION: The time available for completing the POM process was more than sufficient. Consequently, the formal POMs were completed well before the actual deployment. Circumstances could easily have been different, however, and allowed us much less preparation time. Prior to the POM, personnel, in general, were definitely not in a fully deplorable status. In fact, certain parts of POM were unfinished even as we left Germany. Most notably, we were not equipped with NBC protective mask inserts and glasses. The rear detachment had to send many of those to SWA by courier. For weeks after the POMs and after arrival in SWA, many soldiers did not have what they needed to see with their protective masks on.

RECOMMENDATION: POMs should become a routine part of maintaining our overall preparedness posture. TC 12-17, Adjuntant's Call, The S-1 Handbook, recommends informal battalion-level POMs every two months. Using this routine, units

would be capable of deploying quickly and with soldiers who are fully prepared for deployment.

2. OBSERVATION: Spouse orientation and Family Support Group program was implemented almost immediately after the 16th Engineer Battalion was notified of deployment.

ANALYSIS AND CONCLUSION: Aggressive work by the battalion chaplain and his integration of key and knowledgeable spouses within the battalion and community provided the spouse orientation and support program with a strong foundation prior to 8 November 1990. In addition, the battalion's early identification of noncombatant evacuation operation (NEO) NCO's who would be the stay-behind representatives for each company, and the superb support of the FSG spouses, provided strength to the program. The 16th Engineer Battalion FSG and rear detachment program was recognized by the USAREUR IG as one of the best they had observed.

RECOMMENDATION: In preparation for future deployment, the present spouse orientation and program framework should be incorporated into the garrison standing operating procedures (GSOP) and maintained.

3. OBSERVATION: Iraq engineer intelligence/information packet received from the Engineer School was an important reference/start point for the battalion.

ANALYSIS AND CONCLUSION: The request for information from the schoolhouse prior to 8 November 1990 was a significant benefit. After 8 November, the schoolhouse was overwhelmed with requests for information and publications. In addition, the National Training Center (NTC) breach tape and BCTP team visit were great aids. They helped us design battle drills tailored to the breaching of Iraqi obstacles.

RECOMMENDATION: Alert screening/requesting of all sources of information should be continued by the S2/S3 sections, especially concerning current world events that may affect future deployments based on regional contingencies.

4. OBSERVATION: Shipping containers (MILVANs).

ANALYSIS AND CONCLUSION: Shipping containers were poorly managed. There appeared to be problems from corps level down on allocating containers, tracking containers, and shipping containers to the ports and SWA in a timely manner. The majority of the MILVANs took from 3-4 months to arrive in SWA. Critical items for combat operations, maintenance, and life support were loaded into containers rather than into their organic vehicles, based on guidance from higher headquarters. Units arriving in SWA found that some of the containers had not arrived. Also, there was no system to accurately track those that had arrived. This prevented units from attaining combat ready status until well after the arrival date in country. It lead to critical shortages of maintenance and repair parts.

RECOMMENDATION: Hold shipping contractors to the same standards that commercial shippers demand. In addition, G4/Movement Control Officer (MCO) must allocate an equitable number of containers to each unit based on size; they must ensure that no unit receives more or less than its fair share. If possible, task a unit or units to escort empty containers to the proper posts and packed containers to the proper ports. At a minimum, establish LNOs to track containers from the yard to the units to the ports and back to the deployed units. Ensure that combat critical items are evenly distributed between the organic vehicles and shipping containers.

5. OBSERVATION: General supplies and Field Ordering Officer (FOO) transactions.

ANALYSIS AND CONCLUSION: General supplies and FOO transactions were poorly managed. There were several problems with the requisition, receipt and issue of Class II, III(P), and IV, as well as local purchase items. When the system failed to produce (no status on requisitions and issues not based on the oldest due-out), units took it upon themselves to work around the system. Some units were moderately successful in getting what they needed but this lack of control eventually hurt everyone. Critical general supplies and FOO transactions must be centrally managed to be successful across the division.

RECOMMENDATION: G4/Division Material Management Center (DMMC) should centrally manage critical general supplies and FOO

transactions based on requirements identified by the units. Task units to augment the DMMC if necessary. Distribute these supplies based on equitable plans established by the G4 or G3 in special cases (LORANs, NVGs, etc.). Continue the normal requisition process for other supplies but provide more frequent reconciliations to maintain visibility over the requests.

In-Theater Preparation (ISA to FAA GARCIA)

1. OBSERVATION: Layout and marking of TAA Thompson.

ANALYSIS AND CONCLUSION: Developed plan and briefed CG before departing Germany. The TAA had plenty of space; units were well dispersed. The LORAN navigational devices borrowed from 1st CD were essential for the marking and navigation throughout TTA Thompson. Large numbers of Bedouins occupied the TAA, causing some minor problems (marking stakes were removed, OPSEC, etc). Due to large engineer construction requirements for life support, range and MSR construction and maintenance, engineer elements organic to the division should be one of the first units deployed into theater.

RECOMMENDATION: Thorough planning is essential for smooth occupation of TAA or FAA. Navigational aids must be issued, in adequate numbers, early so that users may familiarize themselves with the aid prior to arrival. Coordination through G-5 with local officials must be done early and repeatedly to facilitate the removal of nationals from the area of operations. Engineer units must be deployed early to accomplish life support,

construction and maintenance projects vital to day-to-day and specific division operations.

2. OBSERVATION: Class V Unit Basic Load (UBL).

ANALYSIS AND CONCLUSION: The most unorganized logistics operation throughout this war dealt with Class V. The disorganization was so great that it took a two-star general to get ammo out of an ammunition supply point (ASP). The problem started at the management level, Corps MMC (material management center) and DAO (division ammunition officer). The matter was further complicated at the ASP by poor accountability and issue procedures. There was never clear guidance on drawing UBL ammunition. This decentralized operation turned into a free-for-all. An E6 from DAO finally tried to control it. The ASP never knew how much ammo was on hand, and it took no less than 24 continuous hours to issue anything. It was almost impossible to track the critically short DOD Identification Codes (DODICS); you just had to be in the right place at the right time to draw those items. The tier system of ammo was vague, and the division and corps had different authorizations for different DODICS.

RECOMMENDATION: DAO should centrally manage the Class V operation, putting the right people in the right places (warrant officer at the ASP, DAO coordinating the efforts of S4s, smart guys closely tracking availability of critically short items, etc). Reorganize ordnance units in order to improve their

efficiency. One section must closely track what is on hand at all times, and one section must control the issue of ammo.

3. OBSERVATION: Iraqi complex obstacle construction and operation.

ANALYSIS AND CONCLUSION: The 16th Engineer Battalion was tasked with constructing an Iraqi style complex obstacle in TAA Thompson. The battalion expended a number of blade and platoon hours as well as man hours accumulating the necessary resources, but only one task force used it.

RECOMMENDATION: A more indepth METT-T analysis at the division and corps level would have determined that VII Corps probably would not encounter a complex obstacle. If it was important enough for engineers to build it, then its use should have been managed at division level.

Combat Operations (FAA GARCIA to Cease-Fire)

1. OBSERVATION: Engineers do not have enough communication nets to meet all their requirements/responsibilities.

ANALYSIS AND CONCLUSION: Company commanders require a 3 net capability (RT 524): Engineer company net, battalion/task force net, engineer task force net. Company executive officers need at least 2 nets: task force/engineer, task force and administration/logistics, and engineer company.

RECOMMENDATION: Configure nets accordingly now. Or determine SOP and set reporting times on nets that cannot be

continuously monitored. Ensure that all units adhere to procedures.

2. OBSERVATION: Engineer specific intelligence was poor, priority intelligence requirement (PIR) was not followed.

ANALYSIS AND CONCLUSION: The PIR list established by ADE was excellent; it was distributed to engineer leaders. Had it been followed, information concerning mobility could have been passed to follow on units. Then engineer staff officers would have been better prepared to advise their maneuver commanders. But the division received only random and vague spot reports (i.e. one grid for a minefield, no description, etc.) and poor obstacle intelligence (OBSTINTEL). The best example of our weak PIR reporting occurred on 27 February 1991 as maneuver brigades ran out of fuel. The HEMTT fuelers got stuck in soft sand about fifty miles behind the division because of faulty trafficability intelligence collection and dissemination. In any operation where enemy obstacles, natural or man made, can interfere with friendly maneuver, obstacle intelligence can become PIR. Finding enemy obstacles or seeing enemy obstacle activity validates and refines the intelligence officer's picture of the battlefield. OBSTINTEL is a critical indicator for verifying the enemy template.[33]

RECOMMENDATION: Develop a solid PIR list based on METT-T. Ensure engineers with scouts, cavalry squadrons, and advance

guards are trained and prepared to obtain specific engineer OBSTINTEL. Then implement the plan.

3. OBSERVATION: Engineer equipment needs a careful review by the engineer school/community.

ANALYSIS AND CONCLUSION: The trailer mounted MICLIC is too difficult to maneuver in the desert (and probably in Europe). The AVLM is a step in the right direction toward increased mobility for the MICLIC. However, the MICLIC itself is probably of limited value due to the availability of double impulse, blast resistant mines and the success of the tank plow. The GEMSS (ground emplaced mine scattering system) is too fragile with too much sophisticated circuitry; also it is trailer mounted. The likelihood of ever getting the GEMSS to the point on the battlefield where it is needed and then to have it work is extremely low. The CEV and AVLB need a common chassis to facilitate maintenance, standardize parts, and improve maneuverability.

Other feedback based on this operation:

Winners: HEMTT family, HMMWV, ACE, SEE, tank plow, navigation devices (global positioning system and LORAN), engineer soldiers, bridge trucks.

Losers: M113A2, 1.5 ton trailers, ground emplaced mine scattering system (GEMSS), MICLIC, AVLB/AVLM, M916 and CEV.

The ACE proved to be capable of maneuvering with tanks and Bradley Fighting Vehicles. Most senior leaders had nothing but

high praise for its versatility and capabilities. The HEMTT and HMMWV performed magnificently and are suitable for any terrain where U.S. forces may be deployed.

RECOMMENDATION: Engineer equipment needs a complete overhaul to provide necessary support to the maneuver TFs, as well as to be able to maneuver and survive in all types of terrain. Navigational aids should be built into every vehicle.

4. OBSERVATIONS: M916 tractor trailers and D7 dozers in combat engineer companies (Corps and Divisional) cannot support offensive operations.

ANALYSIS AND CONCLUSION: M916's and D7 dozers are not offensively-oriented pieces of equipment. They are not designed for cross-country travel or for operation in the front area. So these vehicles travel with the trains; this renders them useless in influencing the battlefield in offensive operations. D7 dozers provide no protection from enemy fire. The M916 and D7 dozer have no place in the forward areas of an offensive operation. Combat engineer companies should have M9 ACEs forward to support armored Task Forces and influence the battlefield. M916 and D7 dozers should be part of a divisional CSE company to provide the division with adequate support for trains.

RECOMMENDATIONS: Provide all combat engineer companies with M9 ACEs for survivability at the forward areas of the battlefield. Place D7 dozers and M916s in the trains as part of

a divisional CSE company to provide an earthmoving capability in a low threat environment for the division.

Redeployment

1. OBSERVATION: Control of rail movements from Bremerhaven/Nordenham to Nuernberg.

ANALYSIS AND CONCLUSION: The 3rd Infantry Division's port control team, provided by the 3/4 Cavalry Squadron and 10th Engineer Battalion, was stretched too thin to properly control the off-loading of the vehicles from the ships and their placement on rail cars. So units were not informed when their vehicles would arrive at home station, and some vehicles and equipment were misdirected to the wrong installation. However, anticipating the potential problem, the 16th Engineer Battalion sent a port liaison team of one officer and two NCOs to Bremerhaven to assist in tracking 240 vehicles and trailers being downloaded from five ships. Besides reporting train numbers and the manifest of equipment on each train, the liaison team was also able to identify mislabeled vehicles while they were still in port, and to re-label them for shipment to Johnson Barracks. This monitoring prevented vehicles from being shipped to the wrong installation. Always send a liaison team forward to track vehicles and/or personnel before a unit's deployment or redeployment.

RECOMMENDATION: Develop a port operations plan which ensures unit representation to assist in the tracking of unit equipment.

The methodology for establishing a control cell for a battle simulation exercise can be used. For a port liaison mission, a team of one officer and two NCOs, and a vehicle should be included in each unit's plan for deployment or redeployment.

2. OBSERVATION: Lack of maintenance structure at homestation to repair vehicles upon arrival.

ANALYSIS AND CONCLUSION: Most of the 16th Engineer Battalion's tools were in MILVANs which arrived late, and the unit's PLL vehicles were some of the last vehicles to be returned to homestation. The battalion's direct support (DS) maintenance battalion, 47th Forward Support Battalion (FSB), was also redeploying from Southwest Asia and did not have their equipment available, nor could they order repair parts. No brake testing machines were operational in the Nuernberg area, and there was a shortage of repair parts. There was also a shortage of transportation motor pool (TMP) assets for units to use in conducting routine business. An ad-hoc system was developed within the 3rd ID(M) to have the 501st FSB order parts for the 16th Engineer Battalion, and records were later transferred to the 47th FSB when they became operational. Unfortunately, approximately 50 percent of the requisitions were lost, potential double ordering took place, and many items were not delivered for over five months. Ultimately, once vehicles became operational, they could not meet USAREUR safety requirements for transporting vehicles and cargo on the roadways. The Nuernberg Director of

Logistics (DOL) did issue a 90 day contract for six leased vans to ease the task of doing routine business, but these leased vehicles arrived over six weeks late. The contract expired before the battalion wheel fleet was 40 percent operational.

RECOMMENDATION: A maintenance/logistics system must be established at the new location before a unit arrives at the new location. A deploying or redeploying unit needs a sponsoring support unit. This support organization must be established to assist redeploying units with maintenance and logistical support. The new base support battalion/Area Support Group structure may provide some support, but a tactical maintenance support unit must be tasked to provide Class III, Class IX and DS maintenance.

3. OBSERVATION: Sensitive items should accompany troops (TAT) on deployments or redeployments.

ANALYSIS AND CONCLUSION: Numerous night vision goggles, bayonets, excess weapons, and NBC equipment were packed in unit MILVANs or vehicles prior to redeployment. To date, one MILVAN with night vision goggles and NBC equipment has not been located. Once sensitive items are removed from positive control, their accountability resides solely on a shipping document or hand receipt. To ensure for positive control over sensitive items during deployment or redeployment, they must have them accompany the soldiers on the aircraft. The soldiers will have them when they land, and commanders will have valid and accurate sensitive items reports.

RECOMMENDATION: Unit SOPs should specify that all sensitive items will accompany soldiers on aircraft; the SOP should specify which items are sensitive.

4. OBSERVATION: Security of unit equipment.

ANALYSIS AND CONCLUSION: Companies controlled their equipment until it was turned over to the port support activity (PSA). At turnover, all battalion equipment had been properly loaded and inventoried. After turnover, a breakdown in security obviously occurred. When the equipment arrived at Johnson Barracks, numerous losses were soon discovered. All of the companies reported damaged, stolen, or lost equipment. Locks had been cut and duffle bags that had been cut open. Security in all phases of redeployment has to be increased.

RECOMMENDATION: During redeployment, the unit redeploying should provide organic supercargoes or increased military police presence should monitor all phases of redeployment.

5. OBSERVATION: Redeployment and reception.

ANALYSIS AND CONCLUSION: On 1 August 1991, the 16th Engineer Battalion transferred from 1st AD and became part of the 3rd ID(M) under the 3rd Engineer Brigade, in accord with the new Engineer Restructure Initiative (ERI) configuration (see Figure 6). The 1st AD was scheduled to move to Bad Kreuznach with its colors. The 1st AD paradigm was broken and life was not the same

under 3rd ID(M). Most soldiers perceived there was resentment by 3rd ID(M) soldiers towards any outside unit that joined the division. The fact that 3rd ID(M) did not deployed to SWA was a contributing factor in their resentment toward those who deployed to SWA. This resentment became common place in day-to-day operations. Personnel actions, awards, promotions, etc., were harder to acquire, even for a soldier who almost "walked on water." Most soldiers were very unhappy with our transfer to 3rd ID(M).

RECOMMENDATION: In our current austere environment, a number of units will be transferred to other units or in some cases they will fold their colors. An attitude of resentment among soldiers or units will only dampen troop morale. We must encourage everyone to put aside their individual bias toward other soldiers and concentrate our efforts on making the United States military the best military in the world.

These lessons learned with recommendations represent only a fraction of the knowledge gained by this battalion during the time it spent in Southwest Asia. Only 1st AD lessons are addressed in this paper. Undoubtedly, other engineer battalions learned other lessons. Combined, these lessons will serve as a basis to improve or sustain future engineer support to heavy divisions.

CONCLUSION

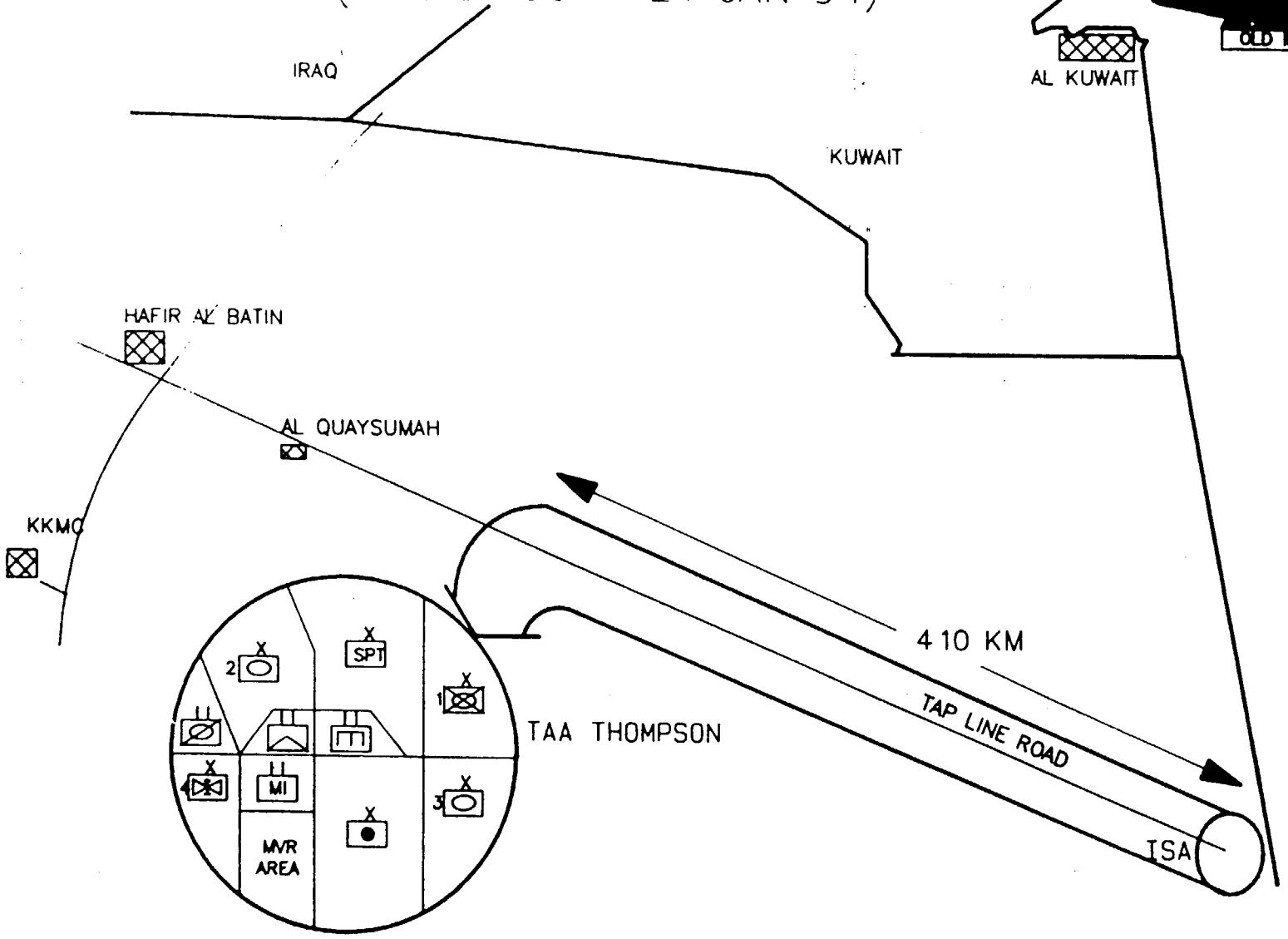
Those who attempt to learn from Desert Storm must be aware that history does not teach, it enlightens. The lessons do not blaze in the search-light of maxims, but they glimmer in the reflected glow of analogies. The art of learning from experience begins with understanding linkage, with an overview of all of the conditions that affect specific events.[34]

One hundred hours of ground combat was too short a period to produce comprehensive judgements about specific strengths or shortcomings. A lot of evidence remains anecdotal. Many unique circumstances in this operation such as the Kuwaiti Theater of Operations, global politics and the enemy himself may not apply to future operations. The entire Desert Storm victory was the product of many years of realistic planning, new doctrinal concepts, modernization of equipment, new unit designs and structures and a training strategy for all components. Our efforts validated the need to train as we fight--in a combined arms context, under realistic battlefield conditions.

The 16th Engineer Battalion leadership team was made up of a whole generation of noncommissioned officers and officers whom the Army trained to be confident, competent, and to lead from the front. They took their great soldiers and trained them, toughened them, cared for them, and led them to victory.

1ST ARMORED DIVISION

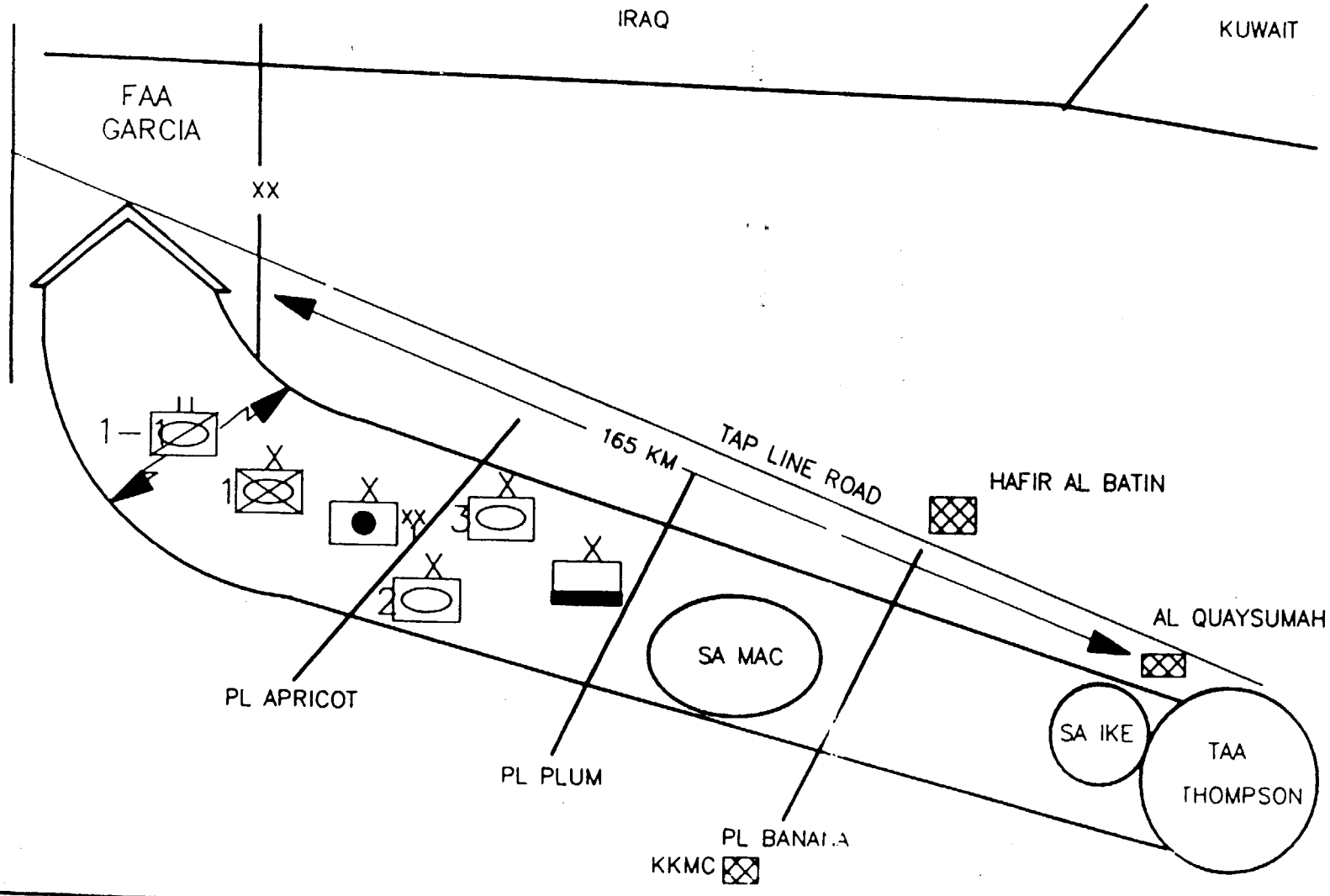
DEPLOYMENT TO TAA THOMPSON
(14 DEC 90 – 24 JAN 91)



MORALE TEAMWORK DISCIPLINE COMPETENCE

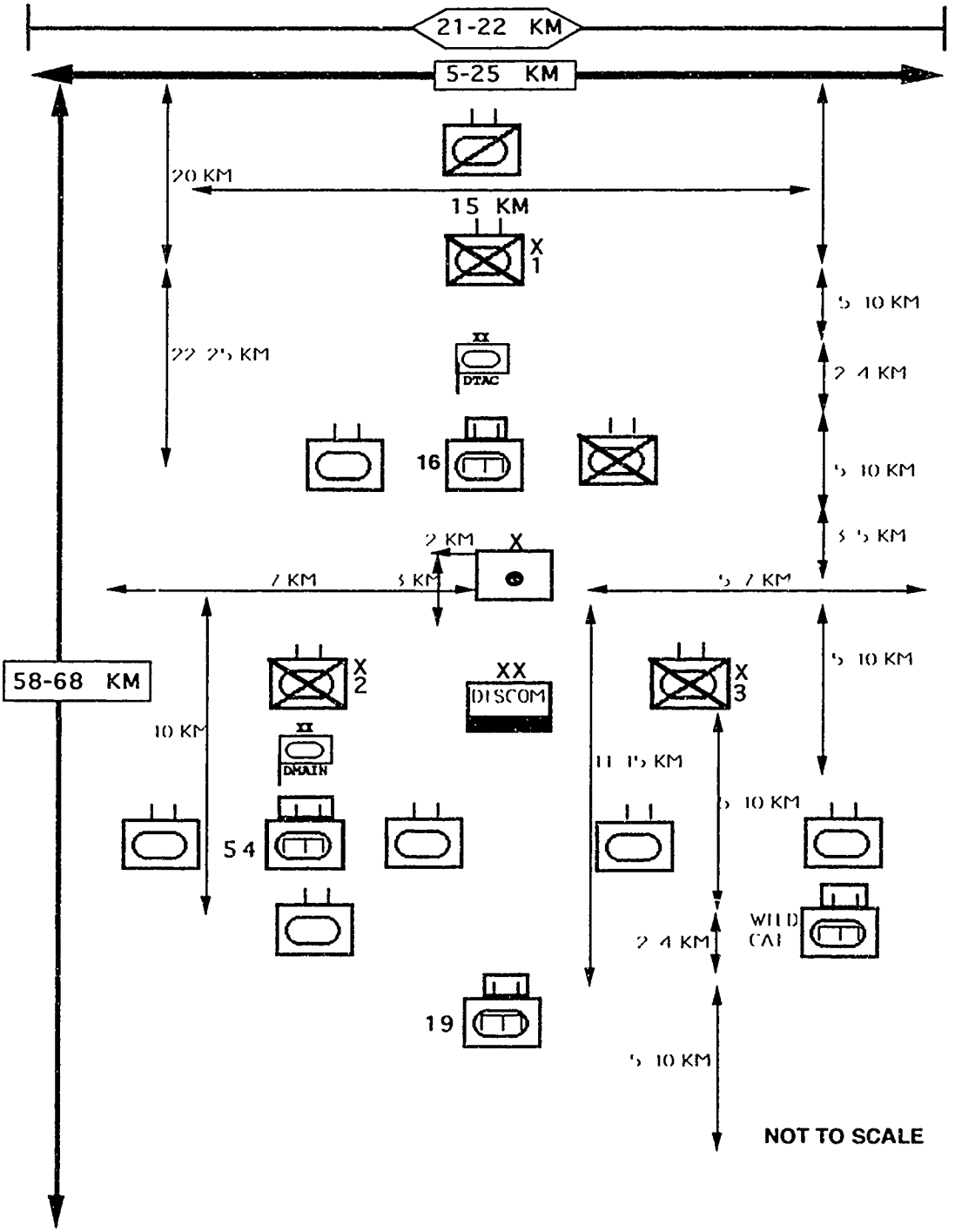
Figure 1: Deployment Route to TAA Thompson

TAA THOMPSON TO FAA GARCIA
(14 – 17 FEB 91)



60

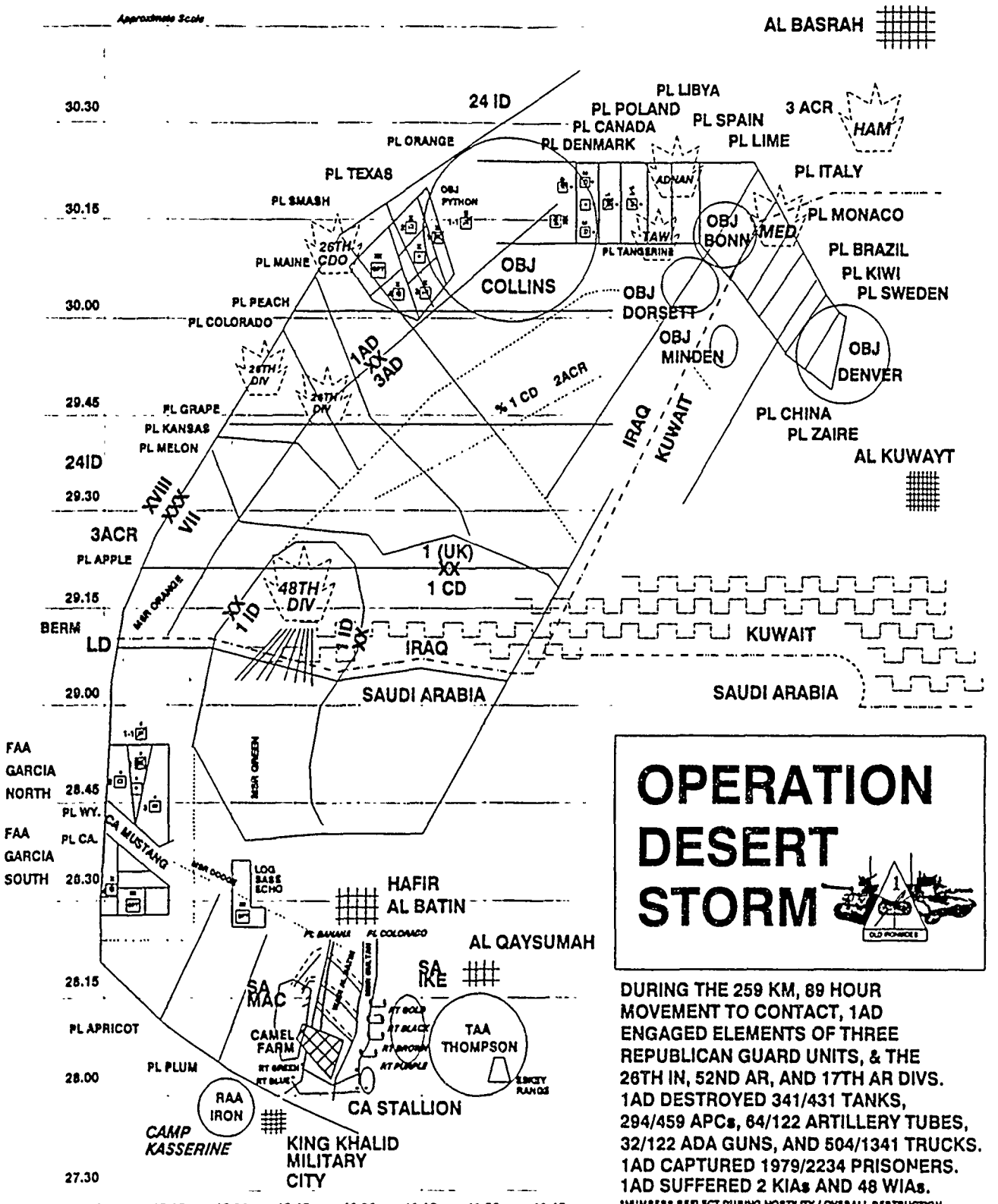
Figure 2: Movement Route from TAA to FAA



1ST ARMORED DIVISION MOVEMENT FORMATION

Source: 1st AD OPORD 9-91, 20 Feb 91

Figure 3



OPERATION DESERT STORM

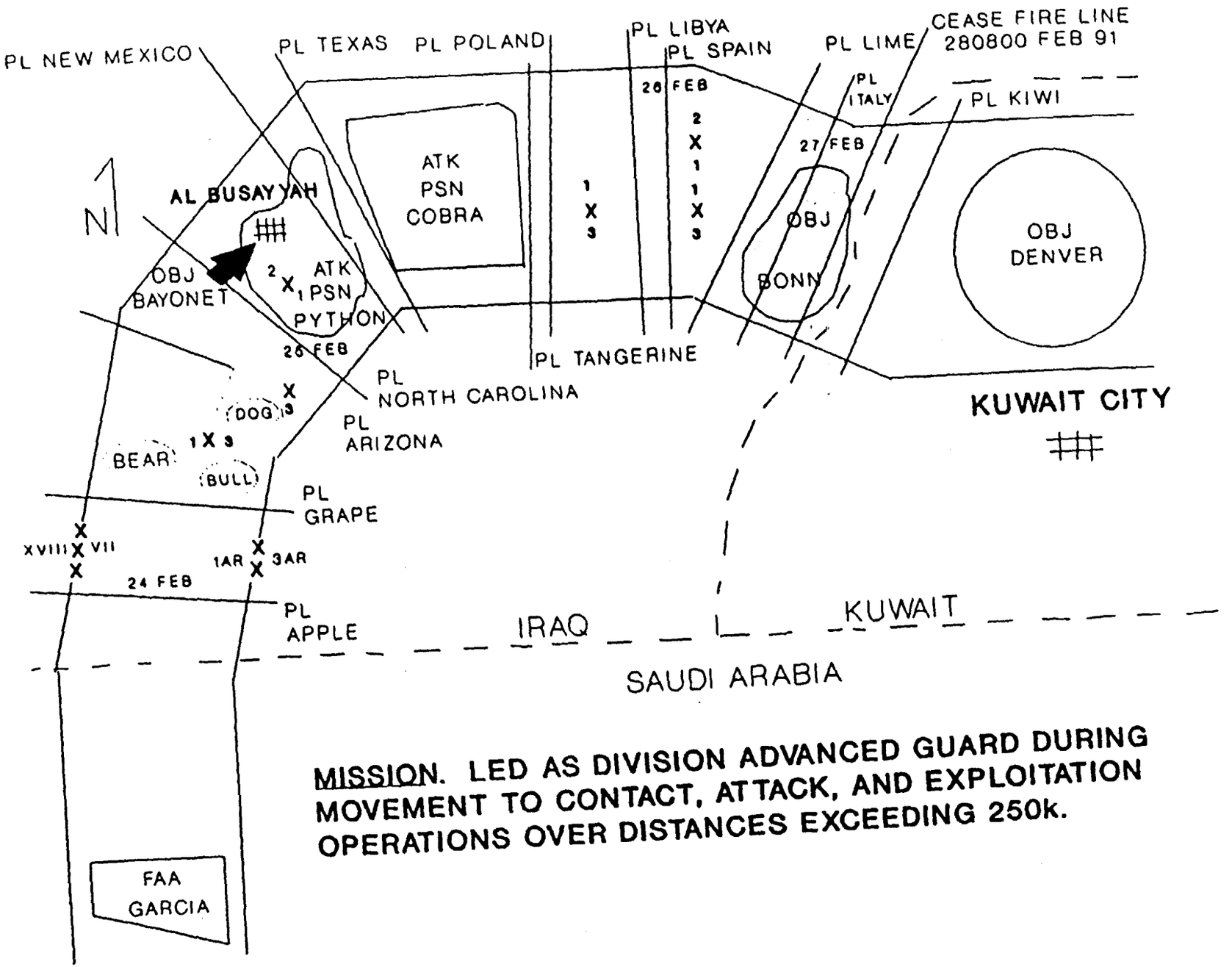
DURING THE 259 KM, 89 HOUR MOVEMENT TO CONTACT, 1AD ENGAGED ELEMENTS OF THREE REPUBLICAN GUARD UNITS, & THE 26TH IN, 52ND AR, AND 17TH AR DIVS. 1AD DESTROYED 341/431 TANKS, 294/459 APCs, 64/122 ARTILLERY TUBES, 32/122 ADA GUNS, AND 504/1341 TRUCKS. 1AD CAPTURED 1979/2234 PRISONERS. 1AD SUFFERED 2 KIAs AND 48 WIAs.

*NUMBERS REFLECT DURING HOSTILITY / OVERALL DESTRUCTION TOTALS AND ARE CURRENT AS OF 15 MARCH 1991.

CREATED BY: 1LT STEPHEN BURK ADE, LNO

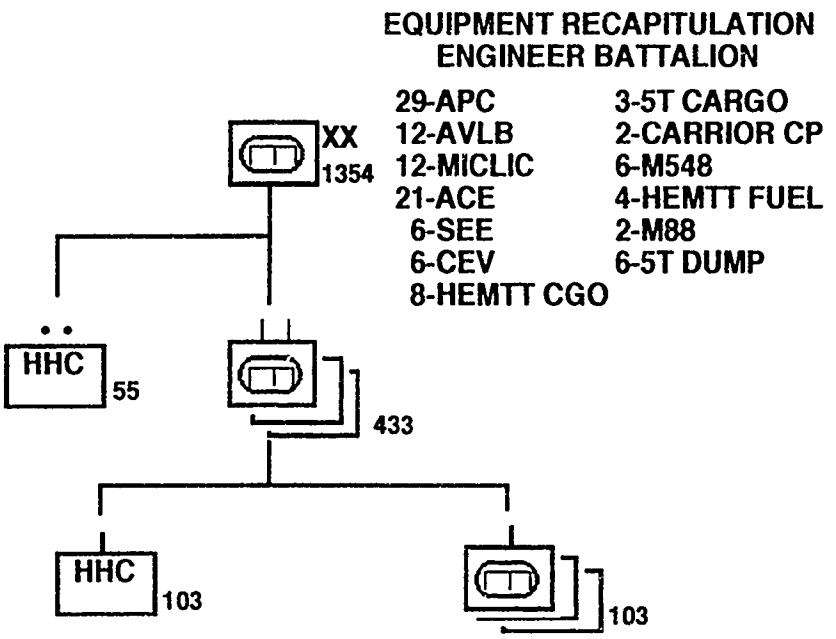
24 FEB: 1AD CROSSED THE LD TO PL APPLE.
25 FEB: 1AD ATTACKED TWO GROUPS OF THE 26TH INF DIV ACROSS PL GRAPE.
26 FEB: 1AD ATTACKD A BN OF 26TH COMMANDOS VIC AL BUSAYYAH.
27 FEB. 1AD MVMT TO CONTACT WITH REPUBLICAN GUARD TAWAKALNA/ADNAN/MEDINAH DIVS VIC OBJ BONN.
28 FEB: 1AD ATTACKED THE MEDINAH ACROSS PL ITALY FOR TWO HOURS. 0800 CEASE FIRE.
01 MAR: CONTINUED DEFENSE IN ZONE AND DESTRUCTION OF ENEMY EQUIPMENT.
02 MAR: REMAINING BDE OF HAMURABI CAPTURED BY 24 ID.

Figure 4: 1st Armored Division Graphics for Desert Shield/Storm



MISSION. LED AS DIVISION ADVANCED GUARD DURING MOVEMENT TO CONTACT, ATTACK, AND EXPLOITATION OPERATIONS OVER DISTANCES EXCEEDING 250k.

Figure 5: 1st Armored Division Movement by Phase Lines



ENGINEER RESTRUCTURE INITIATIVE ORGAINZATION

Source: FM 5-71-100, Feb. 91

Figure 6

DEPARTMENT OF THE ARMY
HEADQUARTERS 16TH ENGINEER BATTALION
APO NEW YORK 09696

AETS-KEN-3 24 MAY 91

MEMORANDUM FOR BN CDR PAA 29 may 91

SUBJECT: TOTAL BATTLE DAMAGE ASSESMENT

1. These are the total recorded amounts of ammunition and vehicles destroyed by the 16TH Engineer Battalion from 23 Feb thru 16 Apr 91.

2. Total Tonnage of Ammunition/Explosives: 8990 Short Tons

   Total Number of Vehicles Destroyed: 447

3. These amounts contain the combined amounts of BDA from elements attached to both 1st and 3rd BDE during Operation Desert Storm.

4. POC is 1LT Wheeler, Assistant S-3

Lawrence A Deren
MAJ, EN
S-3

DEPARTMENT OF THE ARMY
HEADQUARTERS, 16TH ENGINEER BATTALION
OPERATION DESERT STORM
APO NEW YORK 09761

AETS-KEN-3 (350) 24 JAN 91

MEMORANDUM FOR ALL COMPANIES

SUBJECT: Assault and Follow-on Lane Marking Drill for Desert Operations.

1. The breaching of a surface laid minefield occurs IAW combined arms breach in stride doctrine, utilizing the principles of SOSR (S-supress enemy direct fire, O-obscure the enemy view of the obstacle, S-secure the far side of the obstacle, R-reduce the obstacle). The engineer can only reduce the obstacle after the maneuver elements of the combined arms team successfully complete the SOS portion of the breach.

2. The assault breach of the minefield is marked as follows:

STANDARDS

1. Lane is at least 4M (13'2") wide.

2. Multiple lanes are at least 100M apart.

3. Left and right limits of a lane are marked at entrance and exit.

4. VS17 panels (1 ea) will be utilized on the left and right side of the lane entrance and exit.

5. Center line of lane is marked utilizing small flags or strips of engineer tape attached to short stakes. Railroad flares (and/or IR chem lights at night) will be placed along the centerline to facilitate the assault forces identifying the breached lane.

6. Chem lights are utilized at night on the entrance and exit marking stakes as well as on the center line.

7. To aid the maneuver force in identifing the breach lanes as it approaches the obstacle.

   a. 500m from the obstacle on the friendly side there will be a pair of camouflage poles with VS-17 panels mounted (flag style) 100m apart.

   b. 100-200m from the obstacle on the friendly side there will be a pair of "long picket tripods with VS-17 panel wrapped around one leg, pointing towards the lane or two vehicle delinators mounted on long pickets with the arrows pointing towards the lane, spaced 50m apart.

8. Once lane is breached, smoke (color determined by SOI supplemental instructions) will be thrown at the entrance by engineers.

9. Exact BOM used to mark lanes is dependant on availability of materials and situation. Maneuver forces and supporting engineers must ensure that exact lane markings are known.

10. See attached diagram.

POSSIBLE BOM

1. Twelve (12) 1M high poles
2. Twenty (20) 1/2M high stakes per 100M of lane
3. 40 chem lights per 100M of lane
4. One (1) 8lb sledge hammer
5. Two (2) rolls of engineer tape
6. Eight (8) VS17 panels
7. Six (6) long pickets
8. Six (6) camouflage poles
9. Ten (10) railroad flares &/or IR chem lights

NOTES

1. The lane should be marked as follows:
   A. Entrance - six (6) stakes - two on the left and two on the right w/ engineer tape attached to each set of stakes on the left and right side. Two stakes with VS17 panels, one per side of the lane. See attached diagram.
   B. Exit - six (6) stakes - two on the left and two on the right w/ engineer tape attached to each set of stakes on the left and right side. Two stakes with VS17 panels, one per side of the lane. See attached diagram.
   C. Center line of lane is marked utilizing small flags or strips of engineer tape attached to short stakes. The stakes are place 5-7M apart. See attached diagram.
   D. Chem lights are utilized at night on the entrance and exit marking stakes as well as on the center line.
   E. Maneuver forces must be advised that flares are to be used to prevent damage to passive sights.

3. For follow-on forces, the lane width is expanded as soon as possible to a width of 9M (26'3") and is marked as follows:

STANDARDS

1. Lane is at least 9M (26'3") wide.

2. Multiple lanes are at least 100M apart.

3. Left and right limits of a lane are marked at entrance and exit.

4. Each side of the lane is marked utilizing the HEMMS kit or engineer tapes and poles.

5. Chem lights are utilized at night on the entrance and exit marking stakes as well as on each side of the lane.

6. To aid the maneuver force in identifing the breach lanes as it approaches an obstacle. 100 - 200m from the obstacle on both sides there will be a pair of long picket tripods with VS-17 panel wrapped around 1 leg pointing towards the lane or two vehicle delinators mounted on long pickets with the arrows pointing towards the lane, spaced 50m apart.

7. See attached diagram.

POSSIBLE BOM

1. Twenty (20) 1M high poles per 100M of lane
2. 40 chem lights per 100M of lane
4. One (1) 8lb sledge hammer
5. Two (2) rolls of engineer tape
6. Six (6) long pickets
7. Two (2) VS-17 panels

NOTES

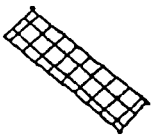
1. The lane should be marked as follows:
   A. Entrance - six (6) stakes - two on the left and two on the right w/ engineer tape attached to each set of stakes on the left and right side. Two stakes with VS17 panels, one per side of the lane. See attached diagram.
   B. Exit - six (6) stakes - two on the left and two on the right w/ engineer tape attached to each set of stakes on the left and right side. Two stakes with VS17 panels, one per side of the lane. See attached diagram.
   C. Each side of the lane is marked utilizing the HEMMS kit or engineer tapes and poles. Poles are placed 10-15M apart along each side of the lane.
   D. Chem lights are utilized at night on the entrance and exit marking stakes as well as on each side of the lane. See attached diagram.

ROBERT S. KIRSCH
MAJ, EN
S3

ENCLOSURES:
1. SYMBOLS
2. ASSAULT LANE MARKING
3. FOLLOW ON LANE MARKING

LANE MARKING SYMBOLS

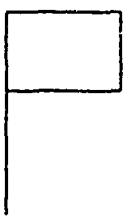
Ⓧ 1m HIGH POLE - 12 EA

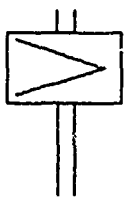

ENGINEER TAPE 3m IN LENGTH

X 1/3m SHORT STAKE (20 EA PER 100m DEPTH OF MINEFIELD) (5-7m INTERVALS)

VS - 17 PANEL

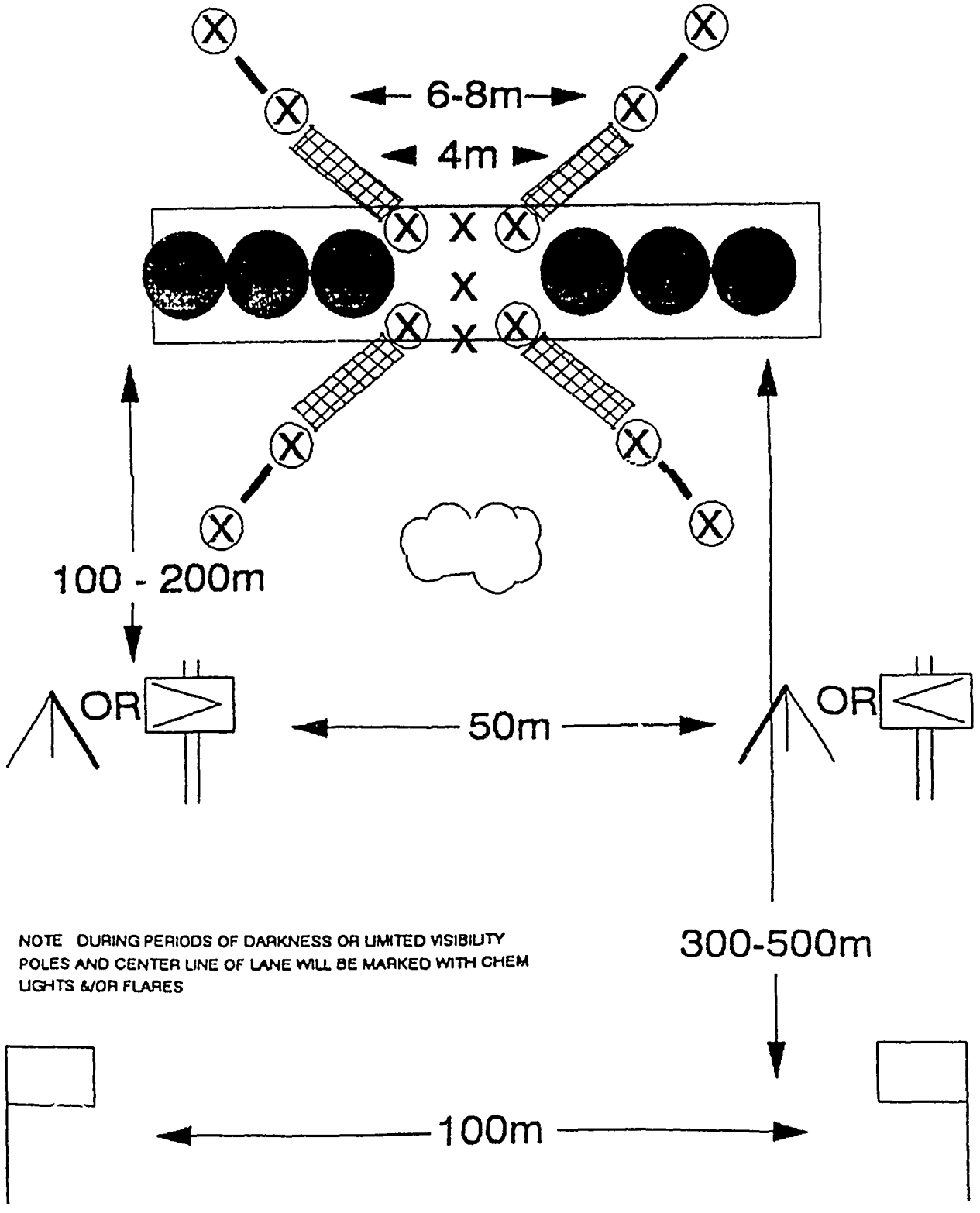

TRIPOD (3 LONG U-SHAPED PICKETS) MOUNTED VS-17 PANEL


VS-17 MOUNTED ON 3 EA CAMOUFLAGE POLES


VEHICLE DELINEATOR MOUNTED ON LONG PICKET

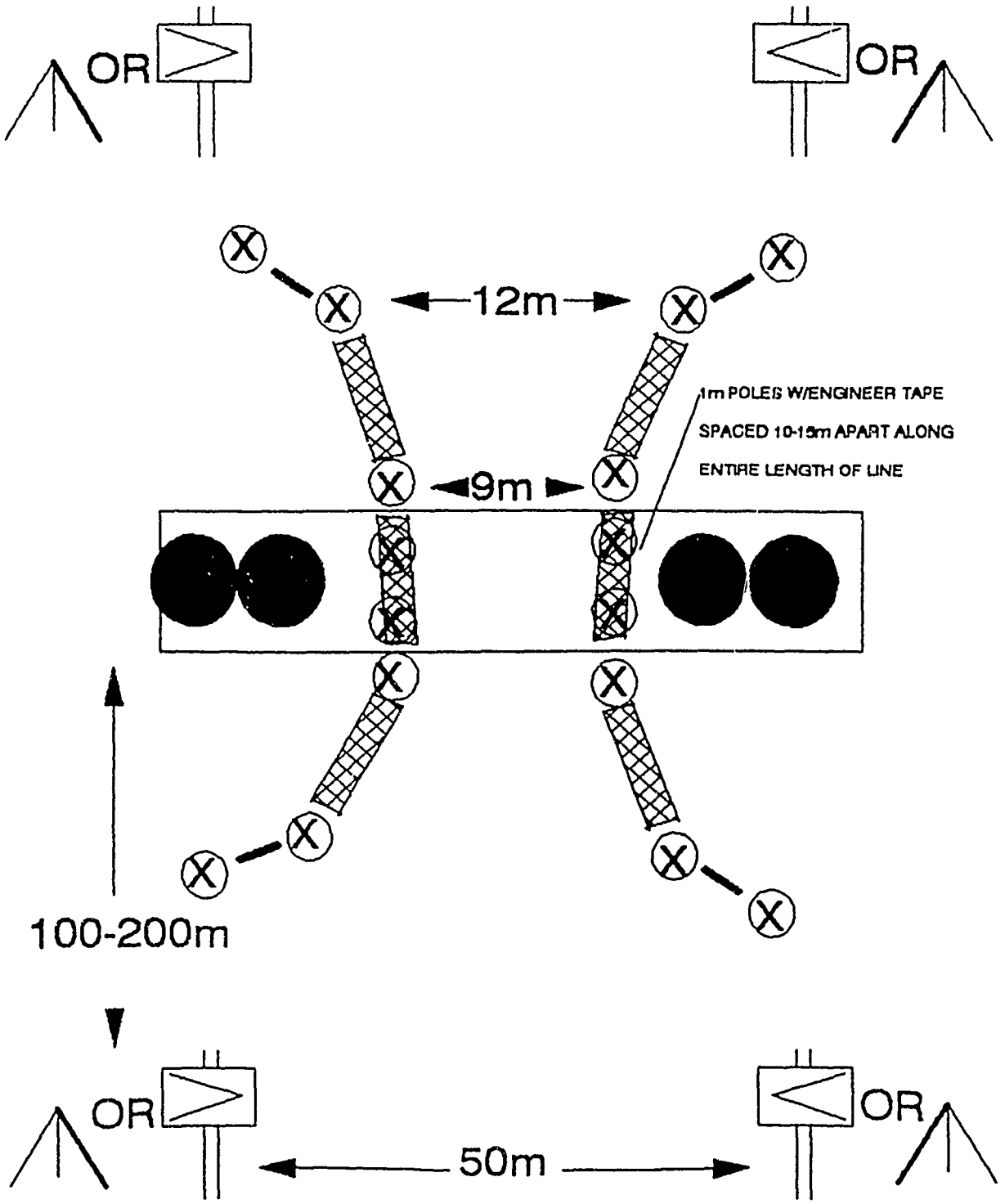

COLORED SMOKE

BREACHED SURFACE MINEFIELD
ASSAULT LANE MARKING



NOTE DURING PERIODS OF DARKNESS OR LIMITED VISIBILITY POLES AND CENTER LINE OF LANE WILL BE MARKED WITH CHEM LIGHTS &/OR FLARES

BREACHED SURFACE MINEFIELD
FOLLOW - ON LANE MARKING



NOTE DURING PERIODS OF DARKNESS OR LIMITED VISIBILITY POLES AND CENTER LINE OF LANE WILL BE MARKED WITH CHEM LIGHTS &/OR FLARES

ENDNOTES

1. Paul Jacobsmeyer and Guy C. Swan, III, "OPERATION DESERT STORM" Ironsides (Ansbach, Germany), A Special Issue for Iron Soldiers of Desert Storm, 22 April 1991, 4.

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